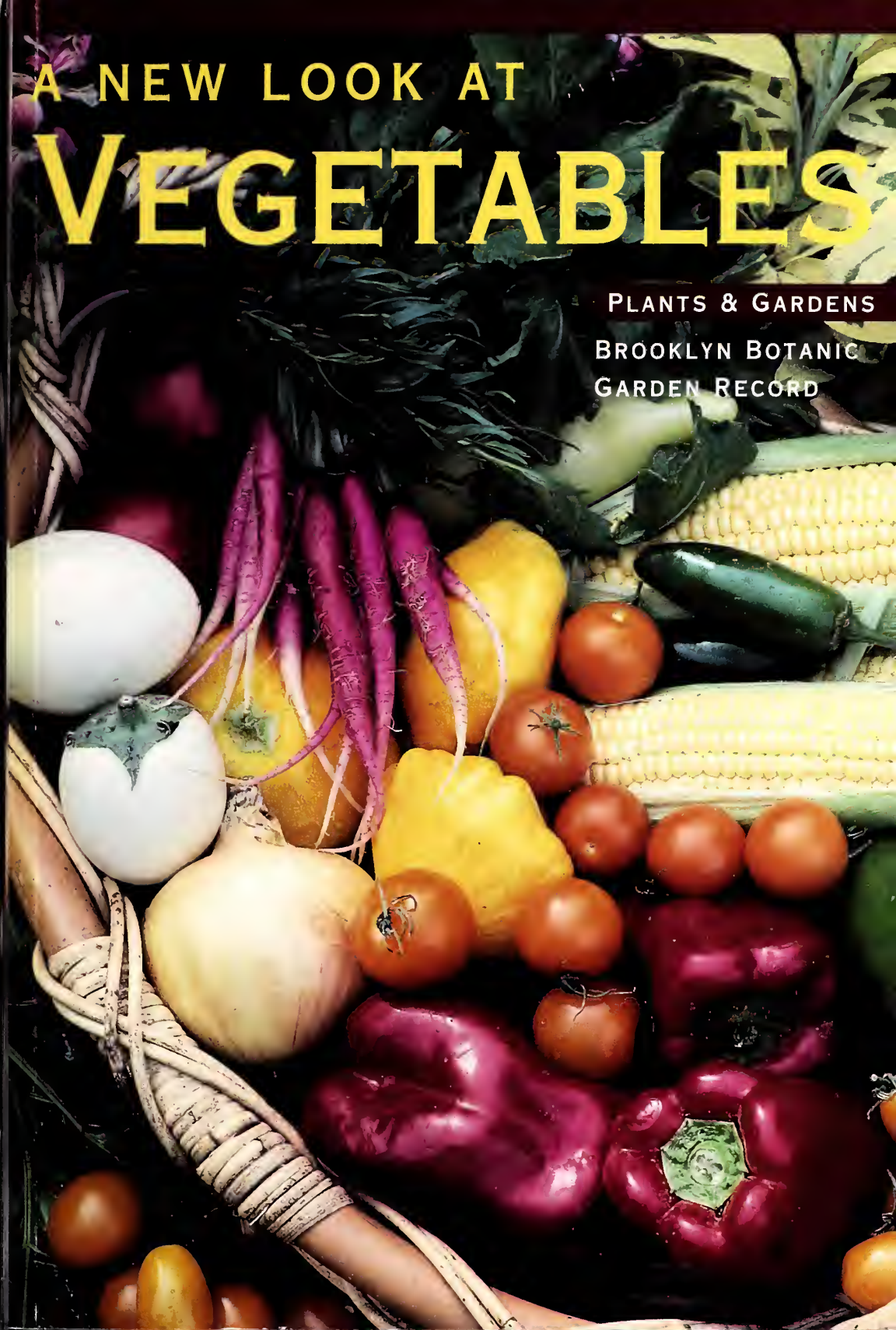
BROOKLYN BOTANIC GARDEN

PLANTS & GARDENS

A NEW LOOK AT VEGETABLES



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BROOKLYN BOTANIC GARDEN RECORD

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BROOKLYN BOTANIC GARDEN RECORD



A NEW LOOK AT VEGETABLES

1993

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PLANTS & GARDENS
BROOKLYN BOTANIC GARDEN RECORD

A NEW LOOK AT VEGETABLES

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Introduction





ROSALIND CREASY

I used to think that as I became a more sophisticated gardener, I would lose my passion for vegetables. The tomato patch would be given over to cutting-edge perennials. Instead of beans, I'd be growing *Heuchera* 'Palace Purple'. Lilies in place of corn.

Well, it hasn't happened. The farmer in me craves to plow yet another field — for more exotic vegetables. This year I grew grain amaranth and have just harvested its nutty kernels. My Black Aztec corn is drying on the vine — but can I grind it in my Cuisinart?



Every year a new crop of garden catalogs includes new and improved vegetable varieties that are worth considering.

My garlic was attacked by root maggots, but I salvaged enough to want to do it perfectly next year. (A sandier patch perhaps?) A trip to Hatch, New Mexico, made me a chile addict — and I returned with the seeds of half a dozen different varieties, some red, some green, some purple, some yellow and orange. And most of them hot enough to leave the guests calling for beer — and then more chile peppers.

There is no greater pleasure than a plateful of juicy ripe tomatoes marinated in olive oil and fresh basil, unless it's potatoes dug right from the ground or green beans picked when they are pencil-thin, steamed just enough to heighten the flavor, and tossed with dill.

In late summer, I stand in the kitchen barefoot, cooking up sauces, sauteing squashes and eggplants, running out to the garden for one more handful of thyme, or one more hot pepper, to make perfection. Who needs to go to some fancy restaurant like Orso in New York City when you can dip your crusty bread in olive oil and fresh rosemary, right there on the front porch, listening to the katydids?

Tasting the earth and the sun in your mouth is about as sensual as gardening gets — other than sticking your nose in a lilac bush in May. And another nice thing about vegetables: almost anyone can grow something the first time out. Oh sure, the flea beetles may devour the eggplants and the cabbageworms will get the Brussels sprouts (mine did this year, through my own neglect), but, chances are, some tomato vine will threaten to grow over the house



Pay particular attention to the new disease-resistant varieties. There are more each year. PHOTOS BY JOANNE & JERRY PAVIA

and spill tomatoes into the bedroom windows. Even if you only have a few containers on the terrace, growing a salad garden, a pepper bush, a big pot of herbs, a barrel of 'Early Girls' will deepen the pleasures of summer. To say nothing of the vitamins and nutrients flowing into your system — sans pesticides or additives.

This handbook cannot, of course, offer a complete grounding in the complexities of good growing — but it can lead the way into the vegetable patch to begin a lifelong adventure.

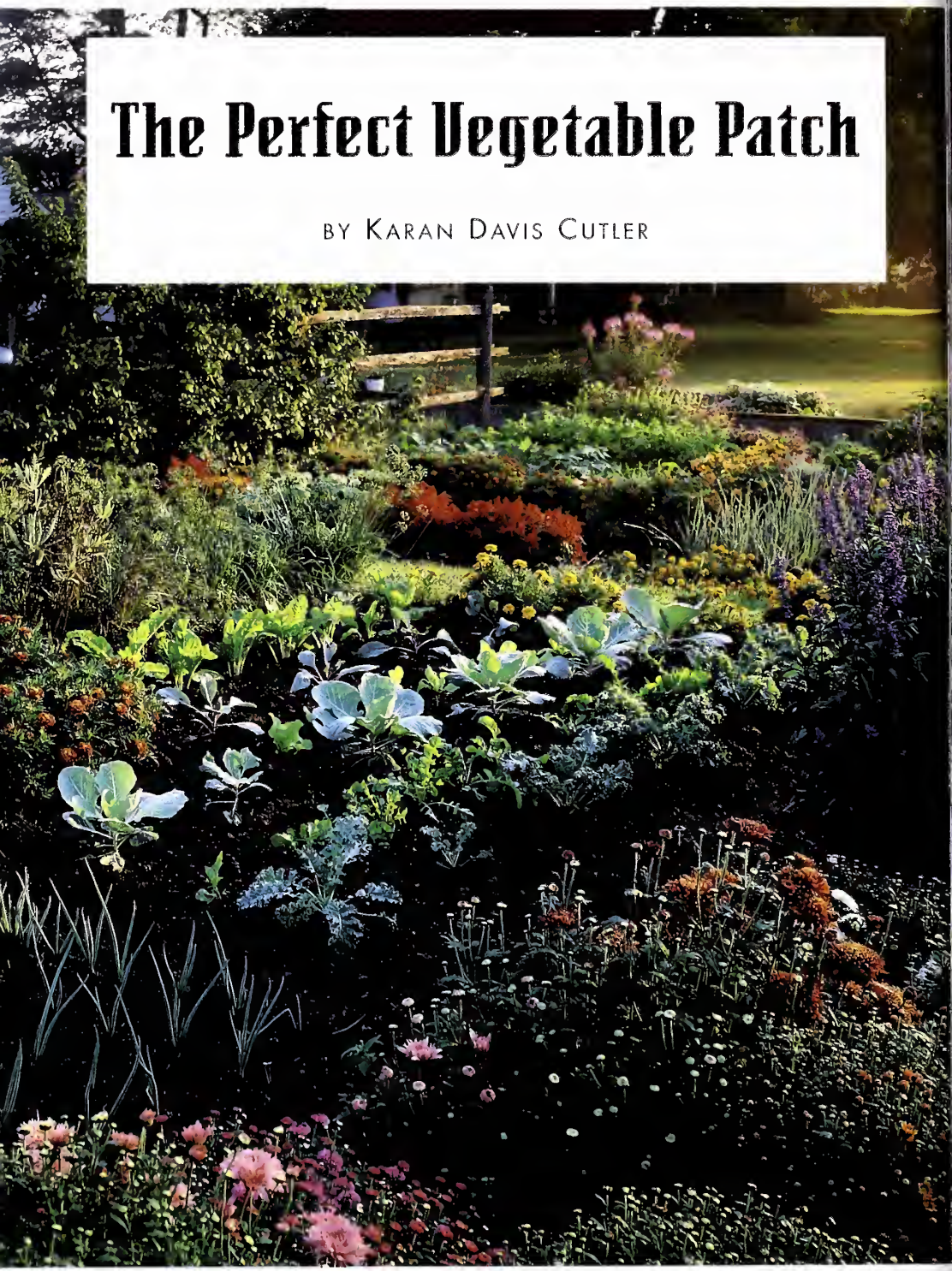
I am an organic gardener and I do not use chemical pesticides, or peat moss, because it is a dwindling resource. Many growers still do — especially those who start seedlings commercially and cannot risk a plague of viruses that might course through soil that has not been thoroughly sterilized. But it is up to all gardeners to look for alternatives, to read and question the corporations mining the peat bogs and making the pesticides and the chemical fertilizers, and insisting on their efficacy. Instead of seeing those bugs in your garden as horrible intruders, think of them as your teachers — even as they eat holes in your cabbage leaves. Gardening is, after all, a balancing act with the earth. As good farmers tell their children, give to the earth, and it will give back to you.

ANNE RAVER
Guest Editor

ANNE RAVER *writes about gardening and the environment for* The New York Times.

The Perfect Vegetable Patch

BY KARAN DAVIS CUTLER



Location, location, location — it's the mantra of real estate agents. And of experienced vegetable growers, I learned by struggling in my first garden, a small plot shaded by silver maples. My crops, slow to ripen, were plagued by leaf spot, powdery mildew and a half-dozen other fungal diseases that thrive in dim light.

Knowing where to site a vegetable garden requires only knowing what vegetables like, and that's no mystery. Thomas Hill, in the first garden book written in English (*The Gardener's Labyrinth*, 1577), set forth most of the basics — matters of light, air, water and soil — often quoting the Roman Pliny who, Hill observed, lived when a garden was no more than "a smal & simple inclosure of ground." Gardens may have changed, but those fundamental requirements haven't.

Yet few of us have the sheltered, sunny, well-drained southwest-sloping 20 x 30-foot plot of organically rich sandy loam located near an infinite source of water that the experts, classical and contemporary, recommend. When faced with the facts of horticultural life — moss-covered ledge impersonating soil, ancient oaks blocking all light from noon until night, offspring demanding badminton courts — most would-be gardeners must surrender, a definition of compromise once promoted by Emerson. The news isn't all bad, however: it is possible to farm a flawed location, to compromise *and* produce vegetables.

"Let there be light" was a universal admonition but surely one with the gardener in mind. When selecting a spot to grow vegetables, sunshine is the most critical and least negotiable ingredient. At a minimum, most vegetables require six hours of sun; eight hours is better; all day is best.

KARAN DAVIS CUTLER *is senior editor of* Harrowsmith Country Life. *She gardens between the rocks of Northern Vermont.*

CROP YIELDS

(when spaced per seed-packet directions)

VEGETABLE	AVERAGE YIELD PER 100-FT ROW
Beets	125 pounds
Broccoli	80 pounds
Bush snap beans	120 pounds
Pole snap beans	150 pounds
Cabbage	150 pounds
Carrots	100 pounds
Corn	10 dozen ears
Cucumbers	120 pounds
Leaf lettuce	50 pounds
Onions	85 pounds
Peas	20 pounds
Peppers (green)	50 pounds
Potatoes	100 pounds
Radishes	100 bunches
Spinach	40 pounds
Squash, summer	150 pounds
Squash, winter	100 pounds
Tomatoes	100 pounds



WALTER CHANDOHA

The ideal vegetable patch is a sheltered, sunny, well-drained, southwest-sloping plot of organically rich sandy loam located near an infinite source of water — something few of us have.

There are a few edibles (see "Vegetables for Partial Sun," page 12) that tolerate darkish settings, mostly leaf and root crops, and in relentlessly hot regions afternoon shade is an asset. But sun-poor gardens are slow to warm in spring, susceptible to diseases and notorious for producing spindly plants and harvests. All the aluminum foil, white mulch, mirrors and other tricks used by those saddled with beclouded gardens won't produce even a basket of second-rate beefsteak tomatoes.

The ideal exposure, especially in the North, is a sloping one, a southern or southwestern site. The greater the incline — the more perpendicular it is to the sun's angle — the more quickly the soil heats up and the smaller the danger of frost. A modestly sloped garden in Cleveland, for example, gets nearly the same solar exposure as a level garden in Cincinnati, 250 miles to the south.

Plants need fresh air as well as sun — Hill warned that "evil aire ... doth not only annoy and corrupt the plants ... but choke and dul the spirits of men" — so avoid placing your garden in a low area, where air stagnates, or a spot that is tightly enclosed. Some protection from the wind is desirable, though. A windward barrier — trees, hedge, fence, wall, building or other windbreak — not only protects plants from damage, it reduces soil erosion, moisture and heat loss. Live barriers, be warned, can

WALTER CHANDOHA



It is possible to produce vegetables in a less-than-perfect location. Sunshine is the most critical ingredient. Most vegetables require a minimum of six solid hours of sun per day.

grow to shade gardens, and if shrubs are planted too close — less than six feet — their roots will filch nutrients needed by your corn and cabbages. (Stay beyond the drip lines, or root zone, of trees, especially shallow-rooted species like willows and maples, and far, far away from black walnut trees, *Juglans nigra*, whose roots exude juglone, a chemical that is toxic to tomatoes and other vegetables.)

Ground where "the watriness shall exceed," as Hill put it, is an inhospitable place for a garden. Plant roots need air as well as moisture, and waterlogged soil is air-poor soil. Solving the drainage problem may be only a matter of opening compacted subsoil or improving porosity by adding organic matter, but seriously wet locations likely have to be drained. That can be a whopping undertaking, one involving ditches, gravel-filled trenches, pipes, tiles, dry wells and other expensive options.

Some gardeners can circumvent poor-draining soil by creating raised beds (conversely, gardeners in arid regions create sunken beds to collect much-needed moisture). Better still is to avoid the problem altogether by testing for drainage before choosing a home for your garden. One easy way to measure soil porosity is to dig a hole, 1 x 1 foot, and fill it with water. Refill the hole the next day and keep track of how quickly it drains: longer than ten hours is a signal that you should plant elsewhere.

Soil, while it receives the most attention from the experts, is the least important consideration when siting a garden because soil is the least immutable. Fertility can be improved; texture and structure can be altered; pH can be adjusted. Over the years, goodly applications of horse manure, straw, leaves and grass clippings have transformed my thin Vermont dirt into "fat earth," the country term for fertile soil. Adding organic matter — the horticultural rendering of Lydia Pinkham's Vegetable Compound — is the best way to cure the ills of soil, sand or clay.

What else? Not all wetness is bad, for one. If your garden is unlikely to receive the weekly inch of rain that is the rule-of-thumb charge for vegetables, try to locate it near a source of water. And try not to locate it near a busy road or the foundation of an old building: automobile exhaust and paint are two common sources of lead contamination. Not setting tomatoes across the shortcut to the garage or two feet from home plate seems obvious.

I like having my vegetables near the house, where I am encouraged to tend them and then can admire my work. For some gardeners, this means turning the front lawn into a vegetable patch or creating an "edible landscape," including vegetables and fruits in the ornamental plantings. While not a new idea — people have been tucking edibles among their dooryard flowers for centuries — it is an increasingly popular one, driven by our smaller and smaller yards. Its culmination is container gardening, raising vegetables in pots and boxes, which allows one to be both farmer and landless. Ever sensitive to trends, seed companies now offer a slew of hanging tomatoes and bush melons to compete with fuchsias and petunias for a place on the deck.

For those of us from the old school — and blessed with plenty of space — nothing is as comforting as the traditional vegetable garden, filled with right angles and order. Vegetables ought to grow in rows, just as dogs ought to come when they're called. I run rows east to west to maximize light, but row direction should depend on the lay of the land. In either case, plant tall crops like corn, tomatoes and pole beans

VEGETABLES FOR PARTIAL SUN

Beets	Broccoli	Cabbage
Carrots	Chinese cabbage	Endive
Garden cress	Parsley	Chives
Mint	Kale	Leaf lettuce
New Zealand spinach	Scallions	Peas
Radishes	Spinach	Swiss chard
	Turnips	

WALTER CHANDOHA



Raised beds warm earlier in the spring, enabling you to get your garden off to an early start. They also have good drainage and are easy to tend. Run the rows east to west for maximum sunlight.

on the north side of the garden where they won't shade shorter plants. (If your site slopes significantly, orient the rows across rather than down the incline.)

How large a garden is up to you and what your space permits. A well-planned, well-tended 600 square feet should keep a family of four flooded with vegetables, but even plots as tiny as nine square feet can provide a summerful of salads. There are plenty of space-saving techniques — wide-row, or intensive, planting, intercropping, succession planting, trellising and more — that will increase harvests without requiring a larger garden. The best plan is to plant what you want to eat, keeping in mind that some vegetables are more "space efficient" than others. (See "Crop Yields," page 9) Based on yields per square foot, value per pound and seed-to-harvest time, the National Garden Bureau rated tomatoes as the most space-efficient vegetable, followed by scallions, leaf lettuce, summer squash, snow peas, onions, beans and beets. Sweet corn, melons and pumpkins, alas, were at the bottom of the list.

Once the site is chosen, the real fun begins. Tilling, sowing, weeding. Discovering the subtleties of place and plant. Gourds "planted in the ashes of men's bones, and watered with oile, yeeldeth fruit by the ninth day," Thomas Hill declared. Whether the rows ran east to west is unrecorded.

A Well-Fed Soil

BY ELIOT COLEMAN

The best model for creating fertile garden soil is the natural world. That's as it should be. The home garden is only a human-managed microcosm of the larger natural garden that surrounds it. Whether forest or prairie or highland or lowland, soil fertility in the natural world is maintained and renewed by the recycling of plant and animal residues. This recycling is a biological process, which means that the most important contributors to natural soil fertility are alive and they are not us. They are the population of living creatures in the soil.



The numbers of soil creatures are impressive. Research has shown that an area of fertile soil supports as great a weight of organisms "grazing" under the surface as it does feeding on the plant growth above. That means if one 2000-pound steer can find a year's worth of food from an acre of grass-legume pasture, there will be an additional ton of valuable

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ELIOT COLEMAN'S *latest book,* Four Season Harvest *(Chelsea Green Publishing Company, 1992), celebrates the potential of eating year-round fresh food from your home garden no matter where you and your soil livestock live.*

"livestock" beneath the ground. Because most of these creatures are microscopic, we are talking about billions and billions of soil inhabitants.

The best approach to creating a fertile soil is to think of yourself as a farmer for *underground* livestock. They need to be fed, housed and cared for. These livestock are much more varied than the steer. They range in size from the microscopic and unfamiliar (bacteria) to the visible and familiar (earthworms). In between is an enormous population of micro- and not-so-micro-organisms whose activities and life processes are as fascinating a tale of ecological design and balance as can be told. I once watched a specialist on soil creatures perform the seemingly impossible task of holding the rapt attention of a roomful of teenagers by showing slides and telling tales of the endlessly interrelated and meticulously choreographed activities of these creatures. The students were entranced because the subject matter was like a trip to another planet. They were peeking into the secret world of nature.

The idea of caring for soil livestock also helps illuminate the difference between a natural and a synthetic approach to fertilizing the garden. In the synthetic approach fertilizers are compounded chemically to put a limited number of nutrients in a solu-

CHRISTOPHER GIAM



The best approach to creating fertility is to think of yourself as a farmer for *underground* livestock, the billions of creatures living in the soil.

ble form within reach of plant roots. The idea is to take charge of the garden and start "feeding the plants" directly with pre-processed food. In the natural approach you the gardener work with natural soil processes to make the plant-food potential of the soil available to plants. You do that by adding organic matter and natural rock minerals to the soil. This is usually called "feeding the soil" as opposed to "feeding the plants." But what you are really doing is feeding the soil livestock and that's why it works. As they "do what comes naturally," they break down organic matter, converting nutrients into forms plants need.

Growing a garden by depending on the natural processes of the soil organisms also makes allowance for our ignorance. No matter how much we may think we know about plant nutrition there will always be subtle factors in the natural system that we haven't figured out and that are important for plant health. The soil organisms have much more experience (millions of years worth) than we humans do in providing all the necessary nutrients. Furthermore, plants have evolved to thrive on nutrients in just the forms that the soil livestock provide them.

The environment of the soil world in which these organisms live is obviously important to their survival. Soil is composed of four parts — mineral particles, air, water and organic matter. The mineral particles provide both structure and nutrition. They range in size from the smallest, clay, to silt, to the largest, sand. Different size particles result in different types of soil. The nutrition provided by the mineral particles depends on the parent rock from which they originated. Some soils have a relatively ideal balance of the minerals on which most vegetable plants thrive. Others, like my soil in coastal Maine, which is low in calcium



The many organisms that comprise the soil livestock break down organic matter, converting nutrients into the forms that plants need.

and phosphorus, will benefit from additions of such minerals as phosphate rock and limestone. Because the soil livestock necessary for good vegetable growth flourish at a pH of around 6.5 to 6.8, the first step in caring for them is to counteract soil acidity.

Much of a fertile soil is composed not of what you can see but what you can see *through*. A good air supply is crucial for the health and survival of both the soil organisms and the roots of garden plants. A compacted, airless soil (like the path where the kids cut across the corner of the lawn) has a greatly lowered capacity for plant growth. An overly wet soil will also kill off the valuable soil livestock through lack of air. Some provision for drainage is obviously necessary. An overly dry soil, however, is not a congenial habitat, either. The moisture in the soil is most favorable to soil organisms when it is in balance — not too much and not too little.

CHRISTOPHER GIAM



But it is the organic matter that is the consistent thread linking soil materials and soil inhabitants. Like the leaf mold on the forest floor and the loam on the prairie it is the key to soil fertility and the well-being of the soil livestock. Organic matter opens up heavy clay soils and gives structure to light sands, making them both better habitats for the soil livestock. The decomposition products of organic matter glue together the natural crumb structure of a fertile soil, so vital in allowing air to enter. The water-holding capacity of organic matter assures ample moisture. Its porosity assures good drainage. And finally, organic matter is the food for all those underground creatures. The numerous byproducts of the consumption and decomposition of that organic matter are the nutrients needed for good plant growth. No life in the soil, no life *on* the soil.

The best way to add organic matter is to spread it on the soil surface in the fall, just as nature does. Mix it in shallowly if you wish. If the organic wastes have been partially predigested in a compost heap, so much the better, but even raw residues will be beneficial. The covering of organic matter protects the soil and your soil livestock against the cold of winter. The soil livestock will begin to transform the organic matter right away. In spring any undecomposed residues can either be raked off and returned to the compost heap or left as a mulch, depending on the seeds to be sown, the plants to be set out or your preferred style of gardening.

So take your inspiration from nature and recycle as much organic residue (weeds, clippings, straw, vegetable waste, manure, leaves) as possible in your garden. Go out there every fall and feed your livestock. Well-fed soil critters mean well-fed vegetable plants. "Ok, gang, it's feeding time...eat up...more where that came from...Anything else I can do for you?...All set?...Bon appetit!"

To Dig or Not to Dig

BY LEE REICH

Spring soil preparation separates gardeners into two camps: the diggers and the non-diggers. Over the years, the ranks of non-diggers have grown — and for some good reasons. Nonetheless, some gardeners still insist on partaking of the annual ritual of turning over the soil. Before discussing the virtues of not digging, let's make short work of the digging camp.

What is the rationale for turning over the soil each year with a Rototiller, spade or garden fork? Digging aerates the soil, and is the way to mix in quantities of organic materials such as leaves, sawdust or manure. There also is a psychological benefit to digging the garden each spring. The hard work stirs the blood as well as the soil. And a freshly prepared seed bed is like a clean slate, with last year's mistakes erased.

If you insist on digging, remember these two basic rules: don't dig too soon and don't dig too much.

The not-too-soon rule: wait for the soil to dry out a little before tilling in spring. Working a wet soil, especially one that is clayey, ruins its crystalline structure. The soil might be good for sculpture, but it's poor for vegetable plants. On the other hand, do not attempt to work the soil when it is bone-dry. Tilling such a soil leaves large, rock-hard clods.

The way to determine if a soil is ready to be tilled is to squeeze a handful of it. If it crumbles easily, it is ready to till; if it wads up, it needs to dry out more. If the soil contains just the right amount of water, a shovel or spading fork will slide in easily. As each shovel or forkful is lifted and turned, the clods will start to break apart from their own weight. Following spadework, gentle coaxing with a garden rake easily crumbles larger clods into smaller aggregates for a seed bed.

Although offering less psychological satisfaction (because the urge to till is less in the autumn), autumn tillage has some advantages over spring tillage. In autumn,

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the ground is usually moist, but not sodden. And tilling in autumn leaves one less task to do amidst the flurry of spring gardening activities. If you do till in autumn, leave the soil rough — pounding from autumn and early spring rains will wash away and ruin the surface of a smooth, finely tilled soil. Let the action of freezing and thawing during the cold months do your work, breaking up large clods. Come spring, you will only need to rake the soil lightly, just before planting, to prepare the seed bed.



The not-too-much rule: if you do dig, do not reduce the soil to a fine powder. Soil particles bind together into aggregates, called peds. Plant roots need both water and air to function, and these peds give the soil a variety of pore sizes. The smaller pores retain water due to capillary attraction, but the larger pores cannot hold capillary water, so quickly drain water and fill with air. Especially with a power Rototiller, it is too easy to pulverize the peds. Control the urge to run the tiller up and down the rows until the soil is like dust. Nothing beats tillage with a shovel, followed by raking, for exercise and for tempering the tendency to overwork the soil.



But is all this work necessary, or even beneficial, for plants? Turning the soil is an age-old tradition that dies hard. Edward Faulkner laid the first serious challenge to this annual ritual in his book, *Plowman's Folly* (1944). Ruth Stout further popularized the concept of no-digging in her book, *How to Have a Green Thumb Without an Aching Back* (1955).

The facts speak for themselves: churning the soil charges it with oxygen, a process that rapidly burns up valuable organic matter. Churning the soil also destroys large channels left by earthworms and old roots, as well as small capillary connections throughout the soil. This connecting system of large and small pores is what moves air and water throughout the soil — up, down and sideways. If you want proof, take a look at the lush plant growth along roadsides and in pastures, where the soil is undisturbed; even midsummer's heat hardly causes these plants to droop. Digging also brings to the surface dormant weed seeds, just waiting for a bit of light and perhaps a bit more air to infuse them with life. And finally, gardeners who forego digging need not delay spring planting until the soil dries.

So what do you do if you do not dig? The best reason to till the soil is to aerate it, but if you avoid compacting the soil, you avoid the need to dig it. To avoid compacting the soil, set up the garden in permanent beds, and never walk on them. Beds three to four feet wide are narrow enough to plant, weed and harvest from paths bordering the beds. (These beds need not be raised beds, which are useful only where drainage is poor, but otherwise tend to dry out too readily in summer.) Eighteen inches is wide enough for the paths, which you can easily keep weed-free with a covering of any of a num-



LEE REICH

In the no-dig garden it is important to avoid compacting the soil. Set up the garden in permanent beds and never walk through them.

ber of materials such as wood chips, sawdust, leaves or even a few layers of newspaper topped by chips, sawdust or leaves.

Starting a no-dig garden is simple and quicker than beginning by digging up the ground. For a site initially in lawn or weeds, the conventional approach is to turn over the soil, wait a couple of weeks for the vegetation to decompose, then turn the soil again and rake it smooth. For the no-dig approach, begin by mowing the proposed garden area, laying out the beds, then sprinkling some fertilizer and, if needed, lime over them. Next, cover the growing beds with four layers of newspaper. This smothers existing vegetation, which, along with the newspaper itself, eventually decomposes to form humus. On top of the newspaper, apply a few inches of compost. Presto! You're ready to plant.

Compost is the ideal surface covering, but other organic materials such as leaves, manure and straw will suffice if you are going to set transplants rather than plant seeds the first season. Make holes through the newspaper, if necessary, to set large transplants in the ground.

Even in a no-dig garden, there is one situation that calls for digging — a site where the soil is a sticky clay that needs quick improvement. But even in this case, digging is needed only once — in the initial preparation of the ground. The goal here is to mix a massive quantity of organic matter into the soil, preferably material that has a lasting effect because it resists decay. Both peat moss and sawdust are resistant to decay, though from an environmental point of view the latter, a "waste" product waiting to be recycled, is preferable to the former, which must be mined from bogs. (In subsequent years, surface additions of organic matter will work their way down into the soil with the help of earthworms.)

LEE REICH



The author's no-dig garden, shown in spring on the opposite page, is still showing healthy, lush growth in September, above.

LEE REICH



In late fall the mulched pathways are visible. Keep the beds three to four feet wide for easy planting and upkeep. Paths should be 18 inches wide.

Wait until the soil is just moist and spread nine cubic feet of peat moss or twelve bushels of sawdust over every 100 square feet of bed. To counteract the acidity of either of these materials, also spread 20 pounds of ground limestone over the area. Soil microorganisms that slowly decompose sawdust need extra nitrogen for the job, so add 40 pounds of a fertilizer having about 10 percent nitrogen (such as soybean meal or 10-10-10) to the above quantity of sawdust. Thoroughly mix the peat or sawdust, and additional materials, into the top six to 12 inches of soil with a tiller, garden spade or fork, and you are ready to plant. Then recycle these tools by passing them along to a still-digging gardening friend — *you* won't be needing them anymore.

Maintain no-dig beds each year by applying fertilizer and lime, if needed, then laying down a one- to two-inch blanket of weed-free compost or other organic material. The weed-free blanket adds additional fertility and smothers most small weeds. Leaving organic matter on the surface of the soil puts it where it does the soil and plants the most good. This layer protects the surface from washing away in pelting rain and insulates lower layers from searing sun. Over time, earthworms eventually "till" some of this organic matter more deeply into the soil.

Even a no-dig garden needs some weeding, especially for the first two years. Dig out large weeds individually with a trowel, roots and all, being careful not to churn the soil excessively. Cut the tops off any small weeds that do grow by skimming the soil surface with a sharp, hand-held hoe. After a couple of years of regular weeding and not turning the soil (hence, not "sowing" weed seeds), you'll notice that the weeds are sparse enough that weeding becomes a pleasant diversion, not an incessant chore.



LEE REICH

A cross section of a no-dig bed shows soil well aerated with earthworm channels. Every year, apply a one- to two-inch blanket of compost.

Full Tilth Boogie

Composting Comes of Age

BY PHIL TIETZ

With today's shrinking landfills, sanitation budget cuts and struggling recycling programs, the importance of composting looms ever larger. As gardeners we have the opportunity to recycle organic solid waste from start to finish — and utilize the finished product, right in our own communities and our own backyards.

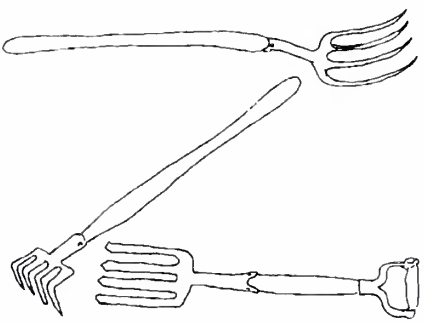
There are a variety of composting techniques suitable for every lifestyle, backyard and budget.

Three-Bin Method

This popular method for backyard composting has cachet. It enables you to boast, "I have a three-bin system," to which other compost-makers will nod approvingly and say, "Yes, yes, very good." Three bins contain the piles of material to be composted; the bins must be at least 3' x 3' x 3' in capacity — one cubic yard. To ease loading and unloading, leave the front of the bins open — then you can simply drive a wheelbarrow right into the bins and dump away. If your compost begins to pile up, just put a plank on the pile and use it as a ramp.

I use a set of three bins that are four feet tall, three feet wide and four feet from front to back. To turn the pile, I rake the compost out onto the ground in front of the bin with a long-handled cultivator, and pitchfork it back into the bin — a lot less

PHIL TIETZ



Composting tools: manure fork, cultivator and digging fork.

PHIL TIETZ *started gardening in Kansas City, where he grew roses as a small child and later developed an organic garden. He has been community gardening in New York City since 1978, and is now the assistant director of the Green Guerillas. He operates three different composting sites in the city.*



JUDY WHITE

For loading and turning compost, a long-handled manure fork or short-handled digging fork come in handy.

work than forking it up and over from one bin into another as conventional wisdom dictates; besides, I can keep all three bins working instead of leaving one empty to turn compost over into.

For loading and turning compost a long-handled manure fork is good for extra leverage. It is especially helpful for turning light fibrous material like hay and weeds. Short-handled digging forks with flat tines are better for finely ground materials. It's good to have both pitchforks on hand. Don't get caught standing on the hay you're trying to fork and straining to lift yourself, as Robert Frost described it.

When you fill up your bins with a good mix of materials — carbonaceous (sawdust, woody prunings) and nitrogenous (manure, kitchen scraps, green prunings) — the pile will begin to heat up. This is a sign of intense activity by bacteria and other microorganisms in the pile. As long as you can keep the pile running hot, the compost will break down quickly. Even after the pile cools down, decomposition will continue as long as the pile is turned and watered. Compost manuals advise turning the pile when the temperature tops out around 140 degees F. A compost thermometer with a long probe can be used to monitor the temperature. But unless you're the type who loves gardening gizmos, simply plunge your hand deep into the pile. If it's so hot you have to pull it out quickly, the temperature is topping out! Hot-running piles speed up composting, discourage flies and rodents and kill weed seeds in the mix. Other than these piddling points they're useful only as a matter of pride. Any pile of organic matter, left to its own devices, will eventually rot. So if you don't want to bother with the turning and the rest, and you have the room, just relax and let nature do the work. Indeed, you don't even need the bins. The easiest way to compost is with a free-standing pile, or a large cylinder or square made from wire or snow fencing to keep your pile under control.

Competitive composters take note: to keep the pile running hot you must turn it at least once a week and keep it damp but not soggy. Leave the top of the bins uncovered to let in rain; if it doesn't rain, hand water. Turn the piles every two or three days to speed up the process. For continuous hot-running piles, you may need more nitrogen-rich materials than the average household generates. Green vegetable scraps are available in quantity at greengrocers or supermarkets; if you're environ-

mentally correct and don't have a lawn, you can get grass clippings from family and friends; and you can get horse manure from many local stables.

You can also avoid the turning by simply heaping up compostables and, once the pile cools down, adding redworms for more complete decomposition. They're sold at fishing-bait stores as "red wigglers" and are available through the mail. You can also get them from gardeners who compost. The worms flee piles that are running hot, so be sure to leave small openings between the bins as escape routes.

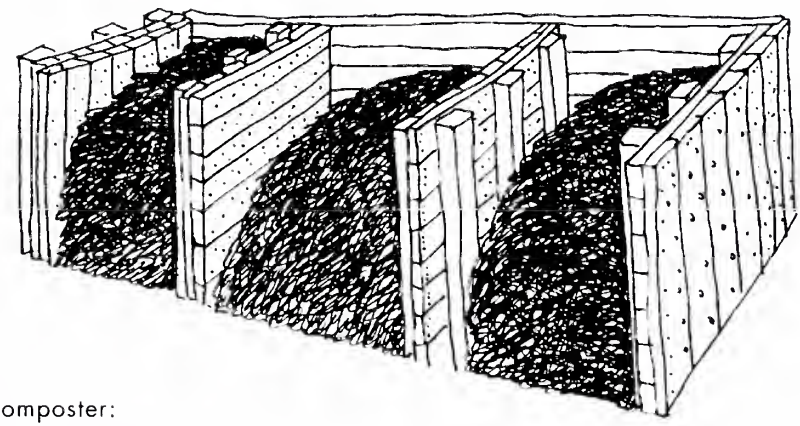
An alternative technique is to turn the pile once or twice, then grow "green manure" on top. Here's how it's done: after the first few turnings the pile will no longer heat up, as the nitrogen level has gone down. To finish off the pile, cover it with a thin layer of soil or finished compost and plant seeds on top. Plant them really thick! The best seeds to use are rye, wheat, oats and dried beans. You can get these cheap from the local health food store, food co-op, agricultural supply or grocery that sells them in bulk. Grow the greens on top of the pile for about 2 to 3 weeks, letting the redworms do their work in the meantime. When the greens are about 6 inches high,

JUDY WHITE



A rustic log bin adds style to the vegetable plot, but the easiest way to compost is with a free-standing pile.

PHIL TIETZ



The basic three-bin composter: built for speed, not looks.



JUDY WHITE

You can make compost bins out of scrap lumber. Just be sure to "paint" them from time to time with a vegetable-based oil to help prevent rot.

turn the pile as usual. It will be finished after one or two turnings. This technique is great for gardeners without access to a local stable or other source of nitrogen-rich materials.

My bins are made of scrap lumber, with holes drilled in all of the sides for ventilation and worm access. I use two layers of planks on each wall for stability and (some) insulation. The supports are 3" x 3" lumber posts, sunk two feet into the ground with the surrounding soil tamped down. To prevent (or at least delay) rotting of the wood, I paint it with a vegetable-based oil from time to time.

Over the winter, I leave at least one bin filled with organic material. My resident redworms, which are not very hardy in cold weather, winter over in this pile. I continue to run hot compost in the other two bins, but composting slows down during the winter unless there's a constant supply of manure, in addition to covers on the piles to hold in heat. A covering of black plastic will collect solar heat to help warm the piles. In winter the piles should never get soaking wet or they may freeze solid.

Closed-Container Composting with Redworms

Worm composting is a popular indoor method, but you can do it outdoors on a larger scale and with less fuss. A good rodent-proof technique, suitable for people with small backyards: use any metal, wood or plastic container (an ordinary trash can is fine) with holes drilled on the sides and

JUDY WHITE



Many different types of commercial composters are available. The one at left in the photo above, which rotates on its long axis, is designed to to make turning easier.

bottom for ventilation, and elevate the bin on bricks or planks. Because you don't want the pile to heat up too high for the worms, use a container less than one cubic yard in capacity. If the compost still heats up, you'll need to take out some of the mix and put it in a separate container. Then add sawdust or shredded paper to both batches.

Use a mix of sawdust, shredded paper and leaves (airy, absorbent materials) and vegetable scraps and green garden waste (wet materials rich in nutrients). With worm composting, it is essential to chop up the ingredients into small pieces or run them through a blender. Make sure there's enough light, absorbent material so the worms can get plenty of air. The bin needs to be kept moist but not soggy.

PHIL TIETZ



Redworms can be used to compost organic materials indoors or outside. They're available at fishing-bait stores.

When the worm compost is finished (dark and crumbly), dump it out and put some of the worms back in the bin with fresh materials. The remaining worms and compost can be added to the garden.

Again, you'll have to give worms shelter in the winter, either in an indoor worm bin or by "farming them out" to someone with large bins until spring.

Pit Composting

In winter (or when putting in a new garden bed), you can simplify your composting of kitchen waste by simply burying it in the garden. You need to dig it in at least two feet deep (remember that we now have rabid raccoons even in Manhattan), and it helps to chop up the material. Putting a thick layer of mulch on top of the soil will encourage earthworms to help break down the waste, as will adding manure when digging it in. The process takes about four months. Be sure you don't dig into the compost pit before that time, or you'll uncover a smelly mess!

Commercial Composting Units

Many different compost containers are available commercially. There are tumblers made as drums or barrels that rotate either horizontally or end over end. These are hard to load and unload; you may need a brace to hold the bin in position while you fill it. Another popular model is a cube-shaped bin with vents sold under brand names like "Soilsaver" or "Biostacker." It's very hard to turn the compost inside these units; you have to lean over and fork it from above or dismantle the unit and move it over (and this takes extra space). There is also a green-cone model designed for composting slow, small batches; this model depends on use of a bioactivator product and may turn anaerobic and smell bad. The advantage of all these units is that they work where larger piles or a three-bin set won't fit.

COMPOSTING RESOURSES

You can refer to the extremely readable ***Let it Rot!*** by Stu Campbell for more information. This book, along with ***Home Made*** and its excellent compost-bin plans, is available from Storey Communications; call (800) 827-8673 to order books or a catalog. Extensive information can be gleaned from ***The Rodale Book of Composting*** or the super-hefty ***Encyclopedia of Organic Gardening*** from Rodale Press, 33 East Minor Street, Emmaus PA 18098. Neccessary Trading Company carries composting accessories and publishes a composting "bio-bulletin"; call them at (703) 864-5103.

Starting Seeds

BY SHEPHERD OGDEN

When the seed racks go up at the garden center, you know spring can't be far away. Out in the greenhouse, the first bedding plants and vegetables are being sown to sell to gardeners when the frost is finally out of the ground. But garden centers rarely offer a comprehensive selection of plants, particularly vegetables, so if you want something special, you're going to have to start it yourself.

My grandfather started most of his transplants directly in the rich soil of a cinderblock cold frame set deep into the south side of a soil berm. When they reached the proper size and the weather was right, he would stop what he was doing and transplant them. Today we are rarely so free with our time, and more likely to start our plants in containers.

Growing transplants in an open tray is one of the most space-efficient techniques, but still requires a lot of time and attention. One ingenious alternative is soil blocks, which combine the best of growing in open flats and growing in individual containers because the roots have plenty of room to roam but don't intertwine. Soil blocks are made with a small, hand-held block press directly from a potting mix relatively high in peat. Preformed blocks of peat can also be used, or peat pots which are filled with potting soil and then placed in trays.

Clay pots allow the soil to breathe, but are breakable and expensive; plastic pots cost much less. Really thrifty gardeners start their seedlings in recycled paper cups, tin cans and milk or egg cartons. You can also make pot-rings from strips of scrap paper and cardboard held together with staples or tape. Stand the rings in trays and fill with soil; at planting time, slip off the ring and set the plant. Many professionals use special trays with tapered growing cells for the seedlings — similar to garden six-paks, but reusable.

What to Grow and How

Some vegetables won't survive transplanting and so there's no point in starting the seedlings indoors. The largest group of

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SHEPHERD OGDEN *is founder and president of The Cook's Garden, a mail order seed and supply house in Londonderry, Vermont.*

these is root crops; others, like dill, fennel and Chinese cabbage, will likely bolt if transplanted. Still others such as spinach grow so fast there isn't much point in starting ahead.

But many plants thrive on transplanting. Make it easy on yourself: buy the common things and raise only the kinds you can't buy.

Slow growers like perennial herbs, parsley, celery and celeriac should be started 12 weeks before their intended transplant date; if you have limited space, buy plants. Tomatoes, peppers and eggplants are a little quicker and can be sown eight to ten weeks before the frost-free date; just be sure to keep the flats at 80 degrees F or more until germination. Most annual herbs also require eight to ten weeks. Brassicas, squashes, cucumbers and lettuce need only be started four to six weeks before the last frost date.

To calculate the proper time to start your transplants, count back from the last-frost date for your garden the required number of weeks. Remember that windowsill gardeners should allow the maximum time noted; gardeners with a greenhouse can afford to be a bit late starting, as the plants grow faster. It is better to have small plants at transplant time than large plants.

A Warm, Moist Place

Peat moss is an important component of most potting soils as its fibrous structure holds water and helps bind together the ingredients of the mix until roots fill the container. Unfortunately, peat must be removed from Canadian bogs, and pure compost is rarely of loose enough texture to be sufficiently aerated, so until a good substitute for peat is found, I recommend buying a commercial soilless mix that contains a large proportion of peat. When filling the container, dump the potting mix loosely into the tray until it overflows, then scrape off the excess. Don't pack it down as both seeds and young plant roots need air; it will pack down when you water.

As a general rule, plant seeds three times as deep as they are across. They contain a tiny replica of the parent plant and a supply of food, dried for storage, and readily sprout as soon as conditions permit. The first stage of germination is swelling, and as the seed soaks up water, enzymes trigger digestion of the seed's food stores. The second stage begins after a few hours or a few days (indoors) with the emergence of the seed root, or radicle. Water intake and digestion reach a steady level. The third stage is when the seedling really starts to grow. This changeover takes place quickly and minute feeder roots soon begin to spread through the soil.

Different vegetables need different temperatures to germinate, but warm room temperature (70 to 75 degrees F) is fine for most. Heat lovers can be put on top of the refrigerator, in the wash room or furnace room, or any high shelf in a heated house; cool weather crops can go in the pantry or some cooler room.

Growing Places

The relationship between heat and light is all-important to growing healthy, vigorous vegetable seedlings. As soon as the first shoots show in a flat it should be moved to the brightest place you've got because too much heat without enough light leads to leggy, limp plants. This can happen even on a bright windowsill because the glass filters out part of the spectrum of light, but lets in the orange-red portion which stimulates stem growth.

Watch out especially for a combination of cool temperatures, low light and overwatering: damping-off fungus can attack and level a whole flat of plants before you know



CHRISTOPHER GIAM

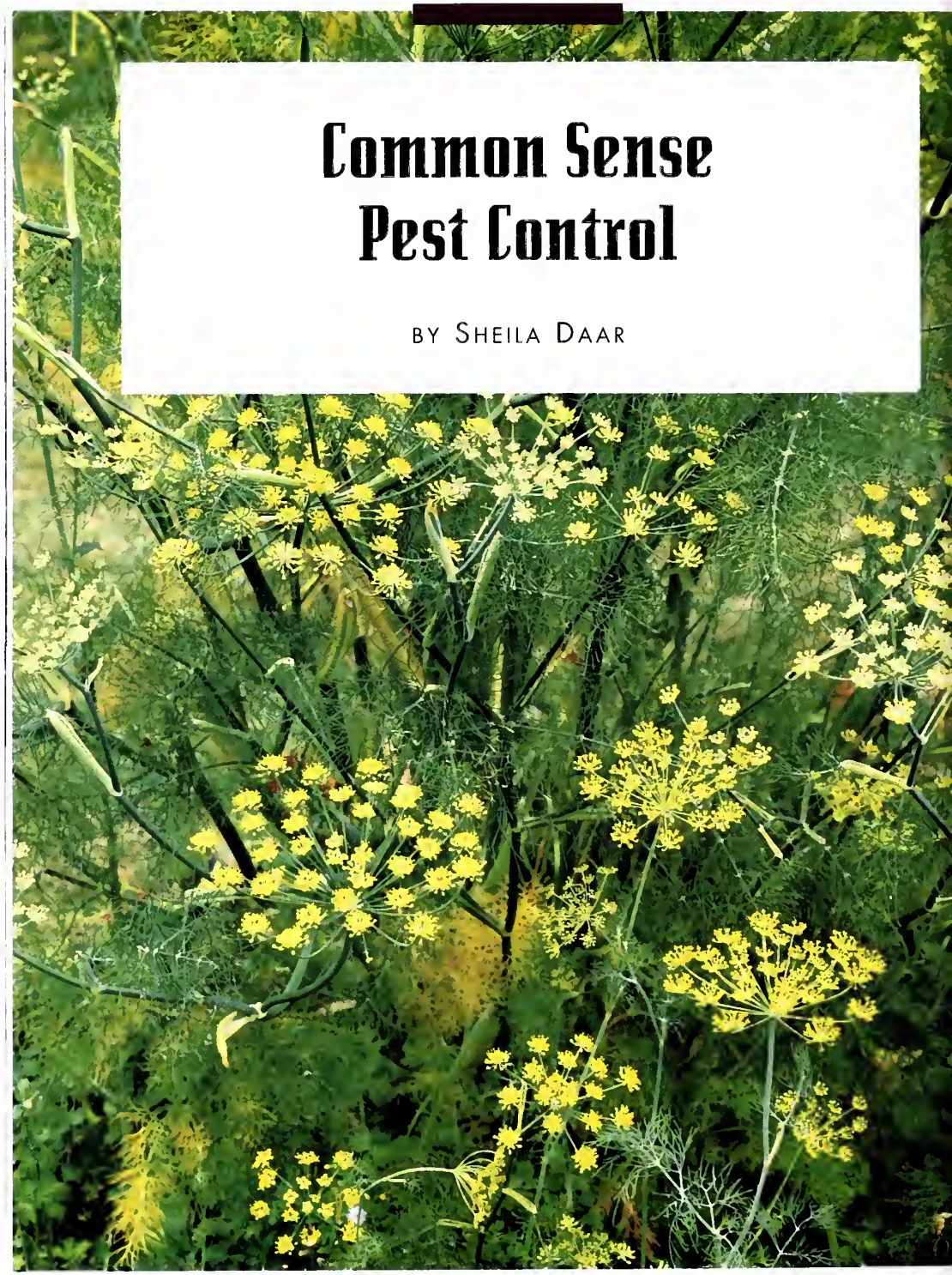
it. If some plants wither at the soil line and collapse, remove them immediatley and give the remaining seedlings in the flat bright light and good air circulation — you may be able to rescue the survivors.

Water and fertilizer also need to be kept in proper proportion. Don't fertilize by the calendar, but rather with every third or fourth watering. That way the plants get fertilized in relation to their rate of growth. We use a combination of fish emulsion and liquid seaweed for our seedlings.

Most discoloration of the leaves is a sign of nutrient deficiency: if the whole plant is pale, there is likely a nitrogen shortage; purplish undersides indicate a shortage of phosphorus; bronzing of the edges means not enough potassium. Fish emulsion contains all three elements, so simply raise or lower the amount of fertilizer in response. There are many other elements, called micronutrients, required for proper growth, and liquid seaweed has a high content of these trace minerals.

To acclimate your seedlings to the stresses and strains that await them out in the garden, put them outdoors for increasingly long periods each day to help them adjust. The most obvious stress is temperature — extreme cold or heat can hurt young plants used to being pampered. Wind is just as hard on the plants and can lead to wilting. Less obvious is the need to adjust your plants to unfiltered sun. Seedlings grown in low light have extra chlorophyll in their leaves, and if they are moved right out into the sun, their light-gathering capability is so great that the leaves may overload, then fade and fall.

Remember: good gardeners mimic nature rather than try to overrule her. "The plants grow themselves," an accomplished gardening friend reminded me a few years ago. "We're just here to help."



Common Sense Pest Control

BY SHEILA DAAR

Today, gardeners are increasingly on the lookout for ways to manage pest problems with little or no use of toxic materials. More and more are relying on a process called "Integrated Pest Management," or "IPM." Principle number one of this approach is that total elimination of garden pests is virtually impossible and rarely desirable. If, for example, all aphids in an area were wiped out, then their natural enemies would also die — leaving a biological vacuum open to invasion by immigrating aphids whose populations would explode in the absence of natural enemies. This syndrome occurs commonly when pesticides are overused.

Instead of eliminating pests, the goal of IPM is to determine at what level pests can be present in your garden without causing unacceptable damage. Armed with this knowledge, you can concentrate on tending to the horticultural needs of your plants and encouraging the presence of natural enemies of pests. Only when these activities don't keep pest numbers within tolerable levels do you resort to more direct pest controls.

Monitoring

When you use an IPM approach you must not only be able to identify pests accurately, you must also learn about the life cycles and behavior of the insects, pathogens, weeds or other pests wreaking havoc in your garden. This process, called monitoring, is key to IPM. There are many things to look for:

Condition of your plants. When stressed from too much or too little water, fertilizer, sun, shade, insufficient drainage and so on, plants are more susceptible to attack by pests. By learning to recognize early signs of stress, you can often correct the horticultural causes and thereby increase your plants' resistance to pest attack.

Evidence of damage and abundance of pests. The mere presence of a pest does not necessarily indicate a problem. It is important to ask yourself: is there any damage? What kind? Holes in the cabbage leaves, for instance? Where on the plant is the damage found? How many pests are present: "none," "a few," "many" or "extremely high numbers"?

Presence of natural enemies. Do you know what feeds on the pest or competes with it? Can you tell how to recognize natural enemies such as lady beetles, syrphid flies or parasitic wasps, and know when they have killed pests? For example, aphids killed by tiny parasitic wasps turn a bronze color, while parasitized immature whiteflies turn black.

Weather and microclimate. How hot, cold, wet, dry or windy is it? Are there specific local conditions such as poor air circulation where the pest problem occurs?

Gardening habits. Scrutinize your regular maintenance activities, because they may be encouraging the pest or discouraging natural enemies: for example, how are your plants watered, fertilized, pruned or mowed? Too much soluble fertilizer encourages aphids and other pests. Watering late in the day can encourage diseases.

SHEILA DAAR *is Executive Director of the Bio-Integral Resource Center (BIRC), and co-author of* Common Sense Pest Control *(Taunton Press, 1991), a 715-page compendium of least-toxic solutions to house and garden pests. For more on IPM techniques and sources of least-toxic products, request a publications catalogue from BIRC, P.O. Box 7414, Berkeley, CA 94707.*

Left: Attract beneficial insects to your garden by growing fennel and other plants of the parsley family.



Wood chips, hay and other organic mulches not only help keep down weeds but also conserve water and enrich the soil as they break down. Mulch can harbor unwanted pests such as slugs, so keep checking for them.

JUDY WHITE



A Hav-a-Hart trap can be used to capture pesky creatures without inflicting injury and move them to a location away from your vegetable plot.

Miscellaneous factors. Some out-of-the-ordinary event may have affected pest levels. If your neighbor backed out of his garage and scraped some bark off your fruit tree several months ago, for instance, it may explain why wood-boring insects are attacking it now.

By staying in touch with these workings of your garden's ecosystem, you will learn to anticipate conditions that can lead to pest problems, enabling you to prevent pest outbreaks or nip them in the bud — before they become serious outbreaks.

Initially, you should monitor on a weekly or biweekly basis during the growing season. Once you've become familiar with the identity, life cycle and behavior of common pests in your garden, you can increase or decrease monitoring frequency depending on the season, pest levels and other factors. The most important thing is to make *regular* inspections of your plants so you can keep track of what is going on. This includes checking plants at different times, since garden organisms operate at various hours of the day and night. Jot down your observations in a garden notebook or pages from a calendar. These written records will enable you to spot pest trends over time, and to use the information to prevent future problems.

A number of tools will aid your monitoring activities. For example, sticky traps in various insect-attracting colors, or traps containing chemical attractants called pheromones, can give you an early warning of pest presence. A magnifying glass or ten-power hand lens can help you see tiny insects and mites, as well as the fruiting bodies of fungi that damage plants. A maximum/minimum thermometer is another useful monitoring tool, as garden pests are greatly influenced by the weather. These tools are widely available at nurseries and hardware stores or from garden catalogs.

Establishing Pest Tolerance Levels

The data you collect from your monitoring activities will enable you to establish toler-

ance levels for particular pests. This is a three-step process. First, you decide how much aesthetic or economic damage you're willing to tolerate on your plants (for example, up to ten percent damaged leaves). Second, you observe how large the pest population can grow before your tolerance level is exceeded (you find that more than 20 aphids per leaf badly distorts bean plants). And finally, you establish a treatment level that keeps the pest population small enough so it does not cause an unacceptable amount of damage (if aphids have reached an average of ten to 12 per leaf and natural enemies aren't evident, you may need to apply a treatment to prevent them from reaching damaging levels of 20 or more).

Least-Toxic Treatments

When pest numbers threaten to exceed your tolerance level, it's time to intervene to reduce pests to acceptable levels. The most effective approach is to use a combination of techniques to attack the pest at several vulnerable points. Always begin with cultural, physical, mechanical, biological and educational methods to solve pest problems; *chemical* controls, even relatively nontoxic ones, are a last resort and should be used only when non-chemical approaches have proven insufficient to solve the problem.

The following are major IPM strategies and tactics, together with a few real-life examples. They are discussed here in the order in which they should be considered:

Design pests out of the garden. Sawdust applied to vegetable garden paths prevents weed growth by tying up soil nitrogen.

Modify the pest habitat. Fruit trees planted on a slightly elevated soil mound are protected from contact with standing water, which enables pathogens to attack the root crown.

Horticultural controls. Substituting slow-release forms of nitrogen (compost, sewage sludge and so on) for fast-release fertilizer prevents the excessive nitrogen levels in plants which attract aphids, scales, thrips and other pests.

Physical and mechanical controls. Hand-held vaccuums can suck up whiteflies; fabric row covers can exclude insects and birds from rows of vegetables; copper strips can prevent slugs and snails from reaching plants; spot flamers can desiccate weeds; anti-transpirants (sold to reduce water use by plants) can also serve as barriers to pathogens such as the rust and mildews that attack plant leaves.

Biological controls. Predators (including lady beetles and lacewings), parasitoids (such as *Encarsia formosa*, a mini-wasp that kills whiteflies) and pathogens (like *Bacillus thuringiensis*, a naturally occurring bacterium that kills caterpillars), all of which are available from nurseries and mail-order suppliers, can suppress many common garden pests.

Least-toxic chemical controls. There are a growing number of pesticides that are only slightly toxic to humans and wildlife, target pests selectively and do little damage to natural enemies. These include insecticidal soaps and horticultural oils, absorptive dusts such as diatomaceous earth and silica aerogel, growth regulators that prevent insects from maturing and reproducing and botanical pesticides derived from plants such as the neem tree, which act as antifeedants and repellents.

An IPM approach allows you to work hand in hand with nature to produce a bountiful garden with room for some of the not-so-beneficial critters that insist on sharing our garden space. IPM is more difficult than just spraying a pesticide at the first sight of a pest. But once you have a bit of experience with IPM methods under your belt, you'll find they become second nature. And as these methods restore your garden's natural balance, the number and severity of pest problems will plummet — leaving you a lot more time to enjoy your garden and reap its harvest. ◘



This damage was caused by a tomato hornworm. You can remove these pests by hand or reduce their numbers with tiny parasitic wasps.

The Predator Patrol

Putting Good Bugs to Work in the Garden

BY CASS PETERSON

The most effective pesticides in my garden require no sprayer or other application equipment, are always on hand when I need them and are completely nontoxic when handled properly. They also are easy to store and, best of all, cost nothing.

Granted, it is sometimes a little difficult to distinguish my pesticides from my pests. That's because they are all insects.

In the brave new world of ecologically sensitive gardening, beneficial insects — good bugs that eat bad bugs — are gaining popularity as a way to control destructive insects without chemicals and their often toxic side effects. Unfortunately, too many of these white-hat insects are being marketed just like their chemical counterparts: bottled up and sold as a quick fix. And too many gardeners are buying them, at considerable expense, with unrealistic expectations.

Using insects to combat insects is not a simple matter of exchanging a quart of all-purpose bug killer for a quart of lady beetles. It takes a little advance preparation, a little observation and a bit of patience to get started. The good news is that once the system is in place, it can sustain itself with only minor assistance.

The first thing to remember is that beneficial insects are not rent-a-cops. If you want them to be on continuous patrol in your garden, you will have to provide water, shelter and a continuous supply of food.

CASS PETERSON *is the co-owner and operator of the Flickerville Mountain Farm and Groundhog Ranch, a specialty fruit and vegetable farm, near the village of Dott, Pennsylvania.*



The shy spiders that inhabit every garden are friends, not foes. They capture flea beetles and many other pests in their webs.

Consider the lady beetle, better known as the lady bug, a familiar beneficial insect. Adult lady beetles feed on aphids and some other soft-bodied insects, but the real chowhounds are their grayish-orange larvae. To get the most from your lady beetles, you need to keep them around long enough to lay eggs and produce offspring.

That means having a few aphids around at all times for general snacking.

Here's how it works on our farm: Adjacent to our 12 acres of vegetable beds, we have an alfalfa and clover field. The legumes attract aphids, which in turn attract lady beetles to feed upon them. In late spring, we mow the alfalfa field and the lady beetles migrate into the vegetables. By the time the veggies have been cleared of aphids, the alfalfa and clover have resprouted and begun to attract aphids again. The lady beetles return there and the process is repeated in the autumn.

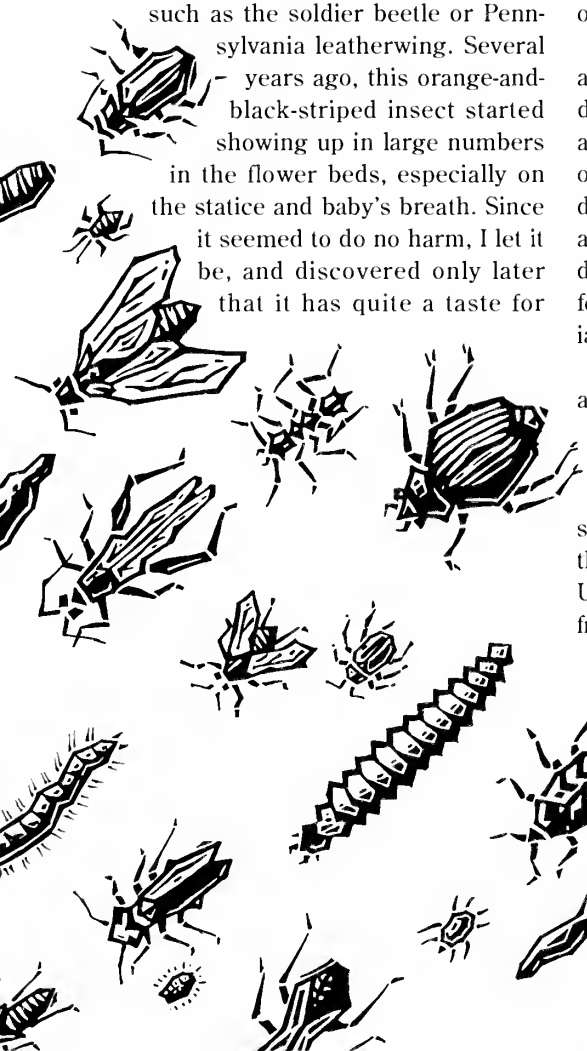
This system can be duplicated on a backyard scale with a small bed of clover in an out-of-the-way place where it won't have to be mowed too frequently. Because adult lady beetles also enjoy a sip of nectar, we are not too diligent about yanking out the Queen Anne's lace and other nectar-rich weeds. In the backyard, a few dill plants, left to flower, would work as well.

Lady beetles hibernate over winter and require shelter. I usually find them in late winter cozied up in some loose tree bark or nestled under old straw mulch. Most horticulturists counsel strict garden sanitation to avoid overwintering pests, but the fact is that the good guys, too, have to sleep somewhere. If a pile of mulch seems too untidy, at least provide a heap of leaves, which can then be tilled into the garden in the spring.

A season or two of catering to lady beetles should reward you with a good resident population, ready to spring into action as the need arises.

Another commonly known beneficial insect is the praying mantis, which is actually not as useful as most gardeners believe. It is nonselective in its diet and will eat lady beetles and other useful insects as readily as insect pests. But it is a striking insect, and when we find its papery egg cases (they look like miniature hornet's nests) we put them in the raspberries where the adult mantids can feed on Japanese beetles.

Among our most useful beneficials are some that the insectaries do not sell, such as the soldier beetle or Pennsylvania leatherwing. Several years ago, this orange-and-black-striped insect started showing up in large numbers in the flower beds, especially on the statice and baby's breath. Since it seemed to do no harm, I let it be, and discovered only later that it has quite a taste for grasshopper eggs. Our grasshopper troubles are gone.



More recently, we have seen an increase in the numbers of spined soldier bugs, prehistoric-looking creatures with long proboscises. The first I saw had a Colorado potato beetle larva impaled on its snout, and I am told they also like to munch on Mexican bean beetle larvae and cabbage worms.

In the orchard dwells another cabbageworm predator, the white-faced hornet. Providing shelter for hornets is perhaps too much to ask of suburban gardeners, but they do have a voracious appetite for caterpillars, slugs and flies. So do yellow jackets, which is some consolation for the occasional stings we suffer each year.

Much less visible, but no less useful, are the tiny parasitic wasps and shy spiders that inhabit our farm. We rarely see a tomato hornworm that is not carrying on its back a fatal load of white sacs, evidence that the trichogramma wasp is alive and well. Sheetweb spiders, crab spiders and other arachnids capture and feed on leafhoppers, flea beetles and myriad other pests.

The diversity of our farm — something always in flower, something always to eat — helps us maintain a diverse insect population, about which we still know very little. But we no longer approach a strange insect with the automatic notion that it is an enemy to be done away with. Until it proves itself foe, we treat it as friend or at least as a noncombatant.

Diversity is also the key for backyard gardeners. It is unrealistic to expect a flourishing insect population in a

landscape that consists of a meticulously groomed lawn, a perfectly weeded flower bed and a carefully tended vegetable garden. Good insect habitat tends to the untidy — a little spot filled with wildflowers, clover and moldering leaves.

Needless to say, a gardener interested in encouraging beneficial insects must use pesticides with a sparing hand if at all. Even the common botanical preparations, such as pyrethrum and rotenone, will kill beneficials as well as destructive insects.

It is useful, too, to have a decent insect identification guide on hand, preferably one with pictures of insects at various stages of their development. Early in my gardening career, I spent most of a year squashing some peculiar-looking bugs before realizing that I was exterminating lady beetle larvae, which look not at all like lady beetles.



BEVERLY DRAKE

The days of this tomato hornworm are numbered. It is covered with the white sacs of the parasitic trichogamma wasp.

The Bambi Factor

BY WALTER CHANDOHA

I live on a small farm in Hunterdon County in rural western New Jersey where commercial and residential development is consuming land at a fast clip. Lots of deer live in the area, too; as we get less and less rural, we get more and more deer. With no natural predators to keep them in check, they proliferate and grow fat on the grain of the few still-active farms, on the shrubs and small trees of newly landscaped homes — and on the vegetables and flowers in my garden.

When we were surrounded by large farms the deer had lots of room to roam and were no big problem. But as their space shrank they became increasingly bold and began to invade my garden and grounds, eating everything in sight. I tried numerous ways to thwart them. Some succeeded, others failed.

When I complained about my plight to an old timer in the area, he suggested a dog to help keep the deer away. So my first line of defense was Kittydog, a big, shaggy Bouvier des Flandre. She was about 75 percent effective. She never harmed the deer; chasing them was play for her. After running them out of the garden, across a field and into the woods, she'd quickly return for lavish praise. After she died, our next dog was Rascal, a small coonhound-type mutt, who was about ten percent effective. He tried to please, but once in the tall grass he couldn't see the deer even when he made his high, arabesque leaps.

Now I was desperate. Out in the country, the county extension service is the best place to go to for help with farm-related problems — and if they can't come up with a solution, they know who can. They told me to call the New Jersey Fish, Game and Wildlife people, who suggested a scent repellant and fencing. The repellant was a dark colored, strong-smelling liquid called Magic Circle. The odor coming from rags soaked with the substance and nailed atop four-foot poles helped keep the deer away. It was about 50 percent effective. To prevent rain from washing the scent away, I covered the rags with inverted flower pots.

Their other suggestions: either a six-

WALTER CHANDOHA, *garden writer and photographer, gardens in Annandale, New Jersey. This article was adapted from a piece that appeared in* Country Living *magazine, July 1991.*



This cute little creature will grow large and fat on the prized trees and shrubs of suburban homes — and the produce of their vegetable plots.



WALTER CHANDOHA

In his never-ending quest to outwit semi-domesticated munchers, the author tried Bye Deer, above, a scent repellant. The flower pot at left covers Magic Circle repellant on the pole. Human hair in panty hose hangs from the shrub.

foot woven wire fence topped with two more wire strands spaced a foot apart for a total of eight feet. Or, an electric fence. A friend of mine finds his electric fence about 90 percent effective. But because I use my garden for many photographic projects, I rejected the idea of either type of fencing.

My next suggestion came from bird photographer Laura Riley: human hair. After collecting it at local barber shops, Ms. Riley stuffs it into sections of old nylon hose, ties the sections into three-inch balls and hangs them near vulnerable plants like her rose bushes. She swears by hair but after trying it in various parts of my garden, I found it ineffective.

Next I tried soap. Saved bits and ends of soap were tied in pieces of nylons and, like the human hair, were hung near vulnerable crops. Didn't work. Next, I drilled holes in brand-new bars of Irish Spring soap (I'd read somewhere that its fragrance was the most effective in repelling deer) and hung them in various parts of the garden. Irish Spring didn't work either.

A hot pepper spray was next. Hot chile peppers and garlic liquefied in a blender and sprayed on the things deer like was

WALTER CHANDOHA



Above: Hinder, a non-toxic spray, proved about 90 percent effective if applied early in the season, before deer discovered the garden's tasty tidbits. The red amaranth at right was devoured in a single night.

supposed to keep them away. No way. If anything, it probably added some zip to the bland vegetables they were eating.

A portable radio tuned to an all-night talk station was also a failure.

I have always questioned the oft-repeated companion planting theory. Grow plant A next to plant B and bug E will stay away from A. I frankly think the theory is not valid but since I like to mix up my garden anyway, I thought I'd give it a try as a deer deterrent. That summer I had lots of alliums, herbs and marigolds interplanted with vegetables all over the garden. The deer ate none of these but they feasted on the peppers, beets, tomatoes, chard, carrots, lettuce, cukes and beans.

Then I thought I had the deer problem solved. They had eaten half a row of beets, but those not touched were adjacent to a row of chrysanthemums which were also uneaten and still being pinch-pruned to make them bushy. I assumed the deer did not bother the far end of the beet row because the scent of the nearby mums repelled them, so I scattered pinched mum foliage over the remaining beets. That night they not only ate the rest of the beets, but the mum plants as well. So much



WALTER CHANDOHA

Deer found the yews above extremely yummy. With three scenic strands of electrified wire on top, the picket fence at left will be about 90 percent effective at deterring deer.

for companion planting as a deer repellant.

Finally, a few years ago, I solved the deer problem with fencing, but used in an unconventional way. At the local farm store I found sturdy wire fencing with a two by four-inch mesh in five- and six-foot heights in 100-foot rolls. Six-foot lengths of the fencing cut off the roll and arched over my wide, raised rows adequately protected any vulnerable crops underneath. The deer could not poke their noses between the fine mesh, and chicken wire placed across the ends kept them from reaching under the arches.

That same fall I found still another 100 percent effective way to keep deer from eating vegetables and flowers: I covered the vulnerable stuff with Reemay or Agronet. Both are feather-light polypropylene sheets used to protect crops from frost and cold down to temperatures in the high 20's. They gently rest atop the plants, admitting light and rain while keeping out cold — and pests like bugs and deer. Lettuce covered with the plastic was untouched by deer but an adjacent row of chard was eaten down to the ground — I had forgotten to cover them with either the Reemay or the arches of wire fencing.

WALTER CHANDOHA

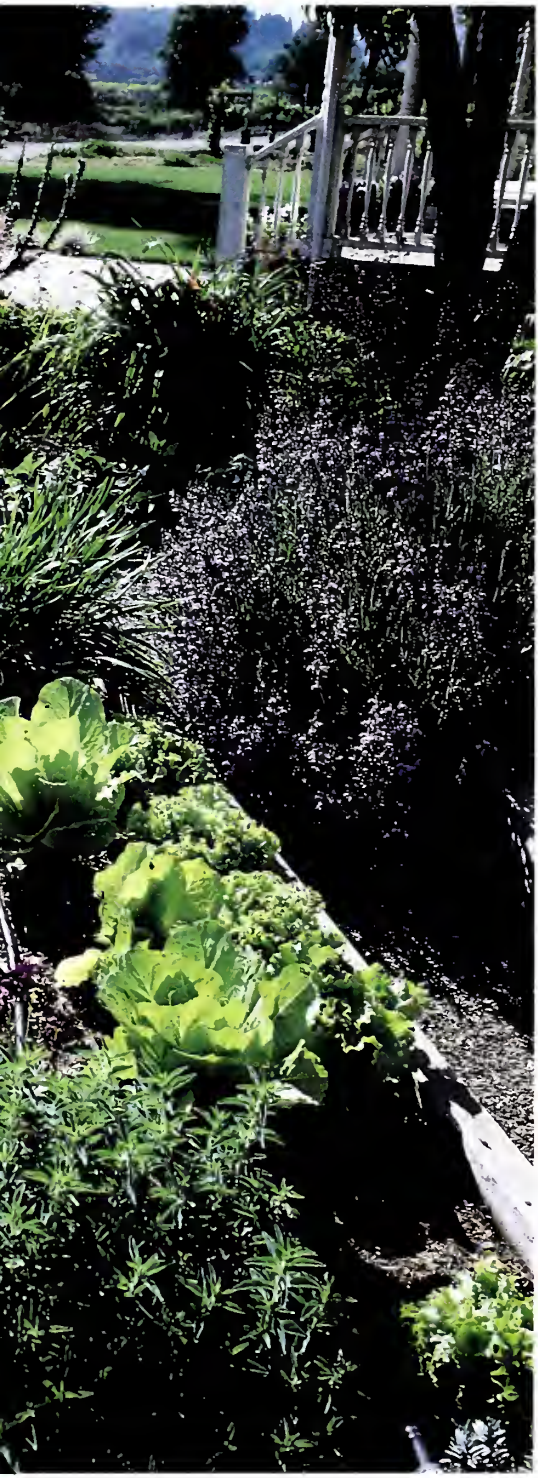


A 100-percent-effective way to keep precious produce safe from deer: lightweight plastic row covers, above, and half circles of wire fencing, right.

Despite my failure with soap and human hair, I'm having some success with commercial scent repellants. Hinder, a soapy spray with an ammonialike smell, is about 90 percent effective if applied early in the season, before the deer have discovered the garden's tasty tidbits. The manufacturer advises reapplication after heavy rains. They also indicate it is non-toxic and can be safely used on food plants.

Another scent repellant called Bye Deer has a sweet smell and comes packed in small green cloth bags about as big as a sack of Bull Durham tobacco. To be effective, the manufacturer says, the bags must be placed in close proximity to the deer food; that is, right where the deer might nibble, not a foot away. So far my tests with Bye Deer have been promising, but I'm still testing.

What with the arches of wire fencing, the plastic row covers and now the scent repellants, I have finally been able to thwart the noshing deer, and the garden is burgeoning. So after all these years of battling Bambi and his family I can once again look kindly at them and welcome them to my farm — as long as they're just sightseeing and will let my flowers and vegetables grow.



ROBERT KOURIK

Drip Irrigation

BY ROBERT KOURIK

Drip irrigation is the most water-conserving way to irrigate just about any plant. Water savings, compared with sprinkler and furrow irrigation, range from 30 to 90 percent, with an average conservation of 50 to 70 percent. Drip irrigation is not just for drought-stricken Western gardens; it produces the most prolific growth and abundant yields in every climate. Gardeners throughout the country who have discovered the secret of drip irrigation are realizing greater harvests, even in areas where summer rain is spotty.

Art Gaus, horticulture specialist with the University of Missouri at Columbia Cooperative Extension, reckons a well-timed drip system could double yields; during the droughts of 1980, '83 and '84, he says, it meant the difference between having a crop or no crop at all. In his own garden, during one season Gaus harvested 32 pounds of

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ROBERT KOURIK *is the author of* Drip Irrigation for Every Landscape and All Climates *(Metamorphic Press, 1992).*

Left: Drip irrigation produces the most abundant yields in any climate.

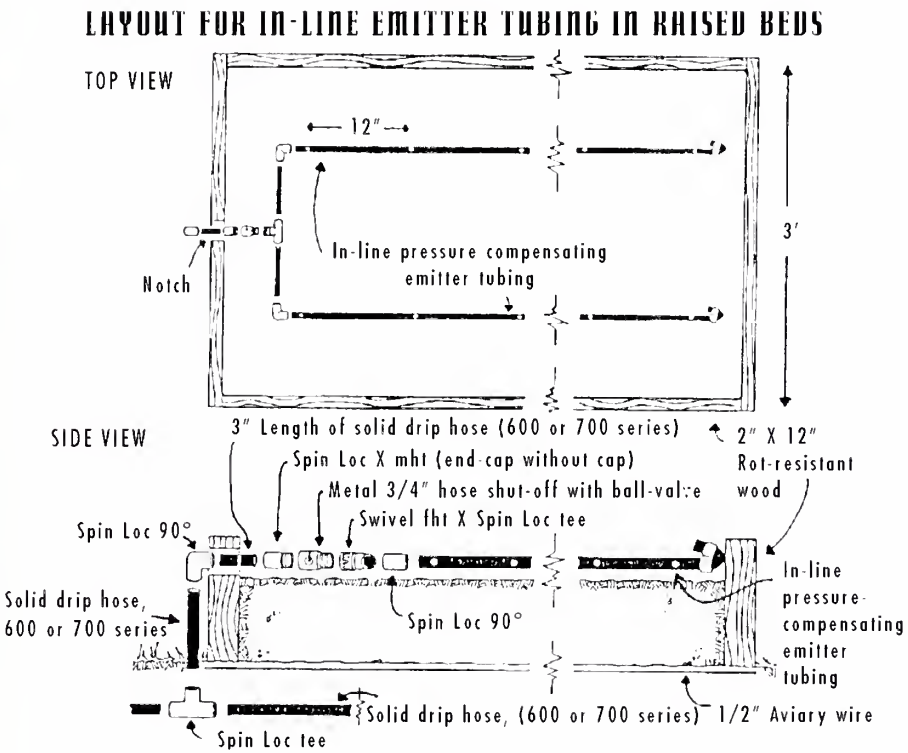
bush watermelons from a 4- by 4-foot area with plastic mulch and a drip system, compared to 9 to 16 pounds from the same sized area with conventional irrigation.

Drip irrigation gets its name from the action of emitters — small devices that regulate the flow of water into tiny droplets that slowly water the ground without flooding. Drip emitters form a "wet spot" beneath the soil's surface that differs in shape according to the type of garden soil, ranging from carrotlike in sandy soil to a squat and beetlike in heavy clay soil.

Of all the applications for drip irrigation — from containers to shrubs to trees — the vegetable garden can be the most problematic. For a good drip irrigation design for annual vegetables, the most important criteria are flexibility, thorough water distribution, easy removal for soil cultivation, sturdy hoe- and trowel-resistant tubing and a low visual profile. After 15 years of fiddling with all sorts of drip irrigation tubing and gizmos, I've settled on a streamlined system that meets the criteria and works with row crops, raised beds and boxed beds (see the illustration below).

All drip systems require three essential parts (often called the "main assembly") at the hose-bib, before the actual tubing that emits the slow trickle of water ranging from 1/2 to 2 gallons per hour. First, all hose-bibs should have a metal atmospheric vacuum breaker to prevent siphoning of dirt and manure into the home's water supply. Second, there should be a filter to

FROM DRIP IRRIGATION FOR EVERY LANDSCAPE AND ALL CLIMATES



The best part of this system for drip irrigating vegetable beds is the fht (female-hose-thread) swivel tee. With the twist of a wrist, you can separate the in-line emitter tubing from the ball-valve and cultivate without obstruction.

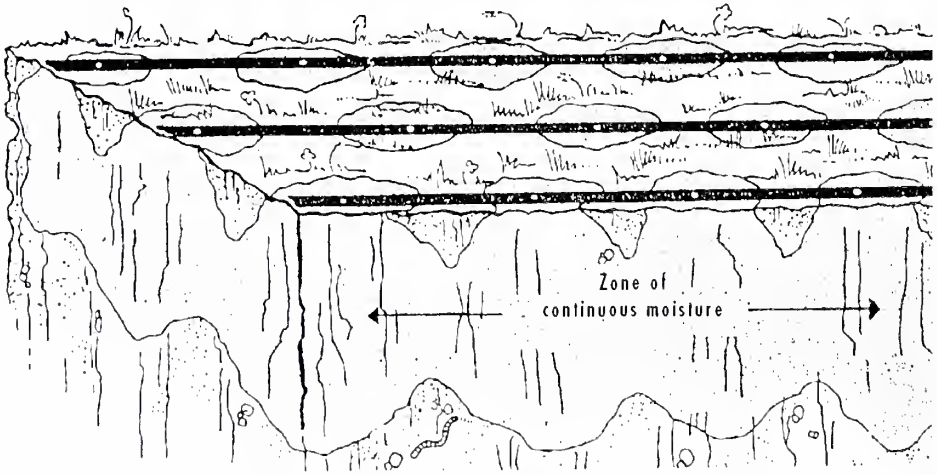
catch any wayward sediment or crud before it can clog the tiny openings of the emitters; a Y-filter, with a ball-valve attached to the end of the chamber for easy flushing, is the best model. And because most municipal and well water supplies are pressurized to 40 to 60 pounds per square inch (psi) — too much pressure for the drip irrigation parts — a pressure regulator, which keeps the pressure at or below 25 psi, should be installed *after* the filter.

Many people think drip irrigation consists of one or two emitters placed near the base of each plant. Such a scheme will keep a plant alive, but will ultimately limit growth because only a small portion of the root zone will receive adequate moisture. The best drip systems have enough emitters so that the wet spots below the soil's surface merge, providing continuous moisture throughout your vegetable plot's entire root zone (The illustration below shows parallel rows of tubing with emitters pre-installed at regular intervals in the black or brown polyethylene hose.) The continuous zone of moisture is 3 to 6 inches beneath the surface, depending upon the soil type. Vegetable transplants can be planted in the dry areas at the surface regardless of the location of the emitters because their roots will be happily exploring the zone of continuous moisture.

Because the emitters release moisture so gradually, the soil's pore spaces don't get waterlogged. The plants' root hairs, not stressed by periodic waterlogging, absorb nutrients more freely, thus improving yields. Michigan State University has documented a 30 percent increase in vegetable crop yields with drip irrigation, even in Michigan's humid climate with abundant summer rain. Drip systems also allow gardeners the option of providing tiny amounts of water on a daily basis to maintain a moist, not wet, soil, which produces the best growth and greatest yields for many crops.

In my garden, I've banned the skinny-diameter "spaghetti tubing" everywhere, with the exception of potted plants. In vegetable plots, spaghetti tubing tangles when you try to remove it for cultivation, is easily damaged by hand and trowel and gets

DRIP IRRIGATION WET SPOTS MERGE BELOW THE SURFACE



The wet spots beneath each in-line emitter merge to form one continuous zone of moisture. The soil for the entire length of the in-line tubing is moist some 4 to 6 inches beneath the surface, depending upon the soil type.

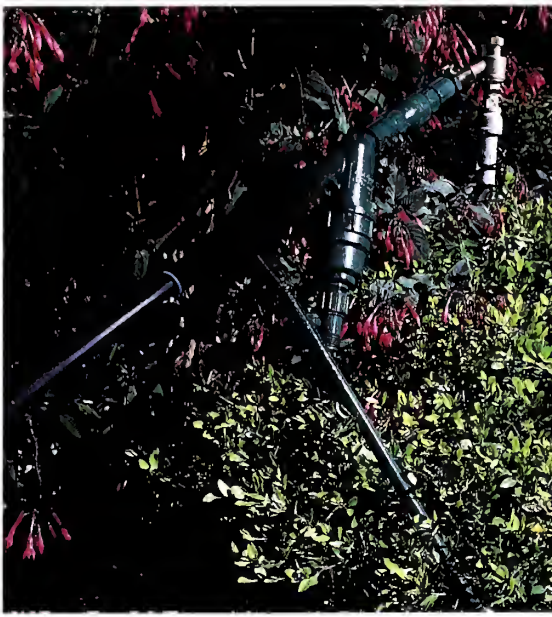
pulled out of the 1/2 -inch solid drip hose it's attached to; also, the emitters at the ends of the hydralike tubing can pop off.

My preferred choice of tubing — in-line emitter tubing — has emitters encased within the 1/2-inch tubing at intervals of 12, 18, 24 or 36 inches. These emitters have a mazelike internal path that keeps sediment from clogging them.

The benefits of in-line emitter tubing are many. It is easy to install, suffers less from clogging than porous tubing and some punched-in emitters, works at the greatest range of pressures (10 to 25 psi) and has no external parts to snap off. Also, the connectors, called compression fittings, seal better than the hose-clamps used with porous hose. After almost ten years of use, I have found only a few clogged in-line emitters in hundreds of feet tubing — even with well water high in iron particles.

The drawbacks of the in-line emitter tubing are few: it's not recommended for plants placed far apart or at odd intervals; it can't turn in as sharp a radius as porous tubing can and it doesn't easily germinate broadcast-seeded crops as carrots, mache, beets and turnips. Broadcast-sown crops must be hand-watered until the seedlings have one or two sets of true leaves, then drip irrigation can take over. Large-seeded crops that are planted farther apart, such as beans, squash and sunflowers, can be germinated with the surface wet spots around emitters.

For annual vegetables, the most important aspect of drip irrigation is easy, rapid removal of the tubing to allow for cultivation. This is accomplished by using an "fht" swivel tee, illustrated on page 49. The "fht" stands for "female-hose-thread"; an fht fitting looks just like the end of the hose you connect to a hose-bib. The tee part, resembling the letter T, allows the tubing to make two right-angle turns. This part is connected either to a ball-valve or directly



ROBERT KOURIK

The "main assembly" consists of a metal atmospheric vacuum breaker to prevent dirt from getting siphoned into the home's water supply, a Y-filter and a water-pressure regulator.

to a garden hose (with a main assembly). To remove the drip system, you simply unthread the fht swivel tee and lift the tubing out of the way. For 3-foot-wide beds with any amount of clay in the soil, only two lines of in-line tubing are required; 4-foot-wide beds might need three lines. If you plan to remove the drip tubing yourself, don't make the beds too long. Lengths of tubing 8 feet-or longer are a bit unwieldy for one person to handle.

A well designed drip system is practically invisible. A thin mulch will hide the tubing before the foliage covers the ground and will protect the plastic from harmful ultraviolet rays.

With your drip irrigation system discreetly in place, you'll be able to fine-tune the amounts of water you apply, whether daily or weekly, to suit the needs of both you and your plants.



Great Greens

BY TERRY KELLER

Greens in the garden offer a variety of tastes and colors throughout the growing season. They are the first vegetables harvested in spring, and can be seeded again in mid to late summer for fall harvests, too. This long season can be extended on both ends of the gardening calendar by taking a cue from the 19th Century French market gardeners and growing greens under glass or, these days, plastic cloches (covers that trap and store radiant energy).

Greens can be loosely divided into two

TERRY KELLER *has been gardening for the past fifty years and is the director of Bronx Green-up, the community gardening program of the New York Botanical Garden.*



PHOTOS BY JOANNE & JERRY PAVIA

categories: the familiar salad greens usually eaten raw in salads (lettuce, arugula, parsley, white mustard and so on) and the potherbs (including collards, beets, spinach and turnip greens), which are usually cooked. Some greens, like spinach, are tasty both raw and cooked.

All greens are easy to grow when the weather is cool (though New Zealand spinach, an Asian vining spinach with a red stem called Basella Malabar and Swiss chard tolerate summer heat), in evenly moist soil rich in organic matter and nitrogen. Most can be seeded directly into the garden as soon as the soil is workable, and germinating plants will withstand lingering frosts in spring and early light frosts in fall.



JERRY PAVIA

Cabbages 'Super Pak', center, and 'Savory King', bottom.

Salad Greens

Salad greens have been cultivated and savored for centuries. One of the oldest greens, arugula (or roquette), was praised by Pliny the Younger thousands of years ago, and was grown by colonists in this country. Today, it's trendy once more.

Arugula should be planted as early as possible in spring, and is best harvested when leaves are four to six inches long. At that point it tastes slightly spicy, like a faintly nutty, mild horseradish. As the weather warms, arugula develops a much stronger flavor — too strong for some. Arugula can be planted again, like many other greens, when the weather cools in fall, and harvest can be extended by lifting plants and moving them indoors to a cool, light spot, or by using cloches. It's easy to make your own simply by covering metal hoops or curved PVC pipe with heavy duty plastic, and they are also readily available through most mail-order seed companies.

Most lettuces also grow best in cool temperatures. Black-seeded Simpson, an early leaf lettuce, emerges quickly when seeded directly into the garden and can be planted every few weeks to ensure a continous harvest before warm weather arrives. However, Buttercrunch, a butterhead variety, Four Seasons, a red-green leaf lettuce, and several head lettuces will tolerate higher temperatures. Seed catalogs usually point out such qualities as likeliness to bolt after the first warm spell.

Lettuces offer many choices and surprises to home gardeners familiar only with grocery store produce. Corn salad (mache), red and green-leafed chicories and radicchio are all lettuces, and all provide different tastes, textures and colors.

Potherbs

Potherbs — the greens to be cooked — are

JOANNE PAVIA



Most lettuces grow best when the weather is cool. Shade helps keep the temperature down.

seeded, grown, cared for and harvested just like the salad greens.

Broccoli raab (or rape) has a sharp but sweet flavor when picked very early in the season. This fast grower should be harvested before its flower buds open into blossoms. Stems, leaves and buds are delicious when steamed with olive oil and slivered garlic. After flowering, broccoli raab should be pulled from the garden and tossed on the garden heap (but do save some of the seeds for next year's crop).

Swiss chard is another easy green to grow. Like most other greens, it tastes best when the leaves are young and tender. Harvest the young outer leaves when they're seven to nine inches long; new leaves will grow out from the center. Swiss Chard tolerates heat well, and a spring planting will produce into early winter.

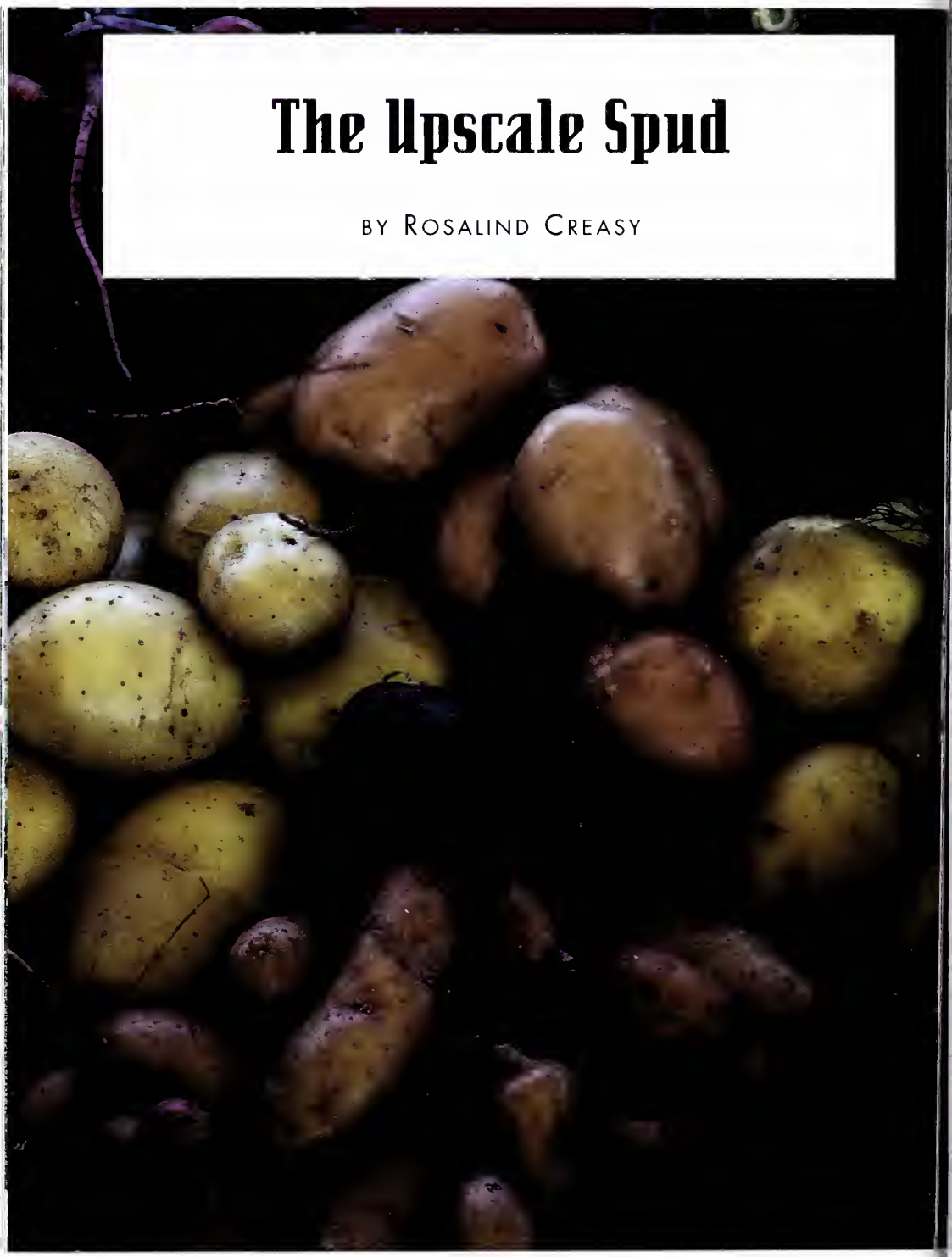
Kale appreciates cooler weather than Swiss chard; in fact, kale's taste improves with light frosts in fall. Mulch it with hay, or use a cold frame or cloche to insure a crop of kale well into winter. When sowing kale seed, work additional calcium (available from ground limestone) into the soil.

Chinese cabbage and other brassicas are also very cold tolerant. These oriental vegetables will withstand temperatures down into the mid 20s, and with protection will provide greens all winter long. Plant them when the soil cools down at the end of summer.

Many more greens await the adventurous gardener, and most are easy to grow. Cool temperatures, well-prepared and well-drained soil loaded with organic matter and diligent thinning and harvesting will fill your kitchen with greens year-round.

The Upscale Spud

by Rosalind Creasy



Purple potatoes for lavender vichyssoise. Rich yellow-fleshed potatoes that appear "prebuttered" when cooked. Classic European potatoes for salade Nicoise. Don't look now, but potatoes have gone "uptown." While the old reliable spuds have long been part of many a comforting meal, specialty potatoes are now adding excitement to garden and table — and a need for a better understanding of our old friend, the potato.

While growing nearly 20 varieties over the last decade, I have found it helps to understand potatoes if you categorize them according to whether they are best baked or boiled. The flaky texture of a good baked potato comes from its "high-solid" content, meaning its large starch molecules and thick skin. Steam forms inside the potato during baking and puffs the starch up; if the steam is allowed to escape, the texture of the cooked potato is light and dry. The large starch molecules also make baking potatoes great for frying and for fluffy mashed potatoes. But when you boil them, the large starch molecules absorb water, expand, soften and break apart — and your potatoes turn to mush.

The best boiling potatoes have small, closely spaced molecules of starch and when boiled, have a waxy, dense texture. Boiling potatoes are superior for stews and potato salad, as they hold their shape well. But when baked, they are fairly heavy and when mashed, sometimes become gummy.

ROSALIND CREASY, *who gardens in northern California, is the author of several volumes, including* The Complete Book of Edible Landscaping *and* Earthly Delights, *both published by Sierra Club Books.*

ROSALIND CREASY



Yellow-fleshed potatoes, right and opposite page, appear pre-buttered when cooked. Purple ones are best steamed to retain their color.

All-purpose potatoes such as Bintje and Yellow Fin can be baked or boiled. When baked, instead of being flaky, they are creamy, and when boiled, they have a soft, starchy quality. The following are some of my favorite varieties.

SOURCES OF SPECIALTY POTATOES

BECKER'S SEED POTATOES
RR1
Trout Creek, Ontario, Canada POH2LO
Free catalog

GURNEY SEED & NURSERY
3106 Page Street
Yankton, SD, 57079
Free catalog

RONNINGER'S SEED POTATOES
Star Route
Moyie Springs, ID 83845
Catalog, $1

SEEDS BLUM
Idaho City Stage
Boise, Idaho 83706
Catalog, $2

Good Baking Potatoes

Russet Burbank is an oblong, six- to eight-inch potato with brown scaly skin and creamy white flesh. Considered superior, it cooks up dry and flaky. Often used commercially for French fries, Russet Burbank is prone to more diseases than some of the other varieties.

Kennebec, an oblong, four- to five-inch potato, has brown scaly skin and white flesh. When baked, it is flaky and flavorful; it's okay boiled. In the garden Kennebec is disease-resistant and a medium producer, and it stores well.

Good Boiling Potatoes

Pontiac, Red LaSoda and White Rose are readily available. They are of good eating quality and productive in the garden.

Rose Fir/Ruby Crescent is a real treat. It's a fingerling-shaped, pink-skinned potato, four to five inches long and one-and-one-half inches wide, with light-yellow flesh and thin skin. Its flesh is dense, waxy, creamy and almost sweet. Plants produce late in the season and need even watering or tubers become knobby.

All-Purpose Potatoes

Bintje, an oblong, four- to six-inch potato, has cream-colored to yellow flesh. It is good either as a moist, creamy baker or as a medium-textured boiling potato.

Yellow Fin is a two-and-one-half to four-inch long, dumpling-shaped potato with tan skin and creamy yellow flesh that looks buttered inside.

Colorful Potatoes

It is truly startling to open a baked potato and find it bright purple. However, not all blue varieties are equally vivid. Purple Peruvians, for example, are bluer than others. Mineral content of the soil and length of storage also affect color intensity.

All Blue, a four- to six-inch long, oval potato with purple skin, usually has deep-blue flesh, but sometimes the flesh is a disappointing light blue that cooks to dull gray. This is a flaky baker, dry in texture with a mild pleasant flavor. Steamed, All Blue is firm enough for potato salads.

Purple Peruvian, a two- to four-inch long, finger-shaped potato, is usually intensely purple inside and out. Best baked, but passable when steamed, it produces a large sprawling plant with white flowers in the garden.

Steaming is the best cooking method for retaining the color of purple-fleshed potatoes. For boiling, add a few tablespoons of vinegar to the water. When mixing colored potatoes with white ones in a salad, add the colored ones last and mix carefully; otherwise, the colors will look muddy.

Growing Potatoes

Potatoes grow best in cool weather, so in early spring purchase local standard variety seed potatoes or order specialty varieties from the seed companies listed at left. (Don't plant grocery store potatoes; usually they've been treated with hormones to keep them from sprouting as they often rot before they sprout.)

In spring, select a sunny, well-drained area with good garden soil. Spread three inches of compost and work into the soil. Make two trenches two feet apart, six inches wide, six inches deep and ten to 20 feet long. Cut up potatoes so that each piece contains two "eyes" or indentations. Place pieces in the trench a foot apart and cover with three inches of soil. When the potatoes start to sprout, fill the trench with more soil until it is level with the existing bed. Once the potatoes are growing vigorously, mulch with compost to prevent tubers from turning green. Water regularly and fertilize mid-season with fish emulsion.



ROSALIND CREASY

Plant seed potatoes in spring in a sunny, well-drained spot.

Avoid high-nitrogen commercial fertilizers as they tend to make the potatoes taste bland and store poorly. Occasionally Colorado potato beetles are bothersome; hand pick or spray them with insecticidal soap.

Storing Potatoes

While some potato varieties store well, others are best eaten soon after harvesting, including Yukon Gold, Bintje and Russet Burbank. Potatoes are best stored in a dark place, at 34 degrees F and high humidity. But they will tolerate temperatures as low as 32 degrees and as high as 50 degrees. The drier the environment, the faster they will shrivel. Remember that if potatoes are stored in any light, the skins will turn green and become toxic if eaten.

The Art & Science of Tomatoes

BY WARREN SCHULTZ

When my family raised tomatoes for market in upstate New York, the hardest part was keeping up with the harvest. I should have such a problem now.

Sheer volume was working in our favor then. With 40,000 plants in the ground, some were bound to produce early fruit. And there was no doubt there would be plenty of vine-ripened tomatoes to slice and snack on, and still get enough to market.

But once I left the farm, tomato growing suddenly got more difficult. With room for only a few plants, I learned a tomato-growing truism: the less space you have, the harder it gets.

I learned quickly that our laissez-faire farm technique — planting the same variety year after year, putting them out late enough to avoid frost and letting them sprawl — wasn't the best garden system. So over the years I've experimented with varieties, both heirlooms and hybrids, and techniques from single staking to weaving to caging to sprawling. I eventually realized that there isn't one single best variety (the earliest tomato will never be the biggest or the most flavorful) or one perfect way to grow them.

The answer is to diversify and tailor your variety selection and technique to suit your needs.

You can't contemplate growing tomatoes without considering the question of growing systems. Staking? One stem or two? Caging? Sprawling? Which is the best way to go? The answer is, that depends. Each technique has something to recommend it. Many gardeners have figured out intuitively that pruning and staking provides earlier fruit while untrained plants offer a greater overall yield.

Recent studies at Rutgers University confirm that. Nine plants were grown there in two-foot diameter cages of concrete reinforcing wire. Nine plants were grown with stakes and pruned regularly so that only one or two main stems remained.

WARREN SCHULTZ *is Editor-in-Chief of* National Gardening *magazine and author of* The Chemical-Free Lawn *(Rodale Press, 1989). He grows his tomatoes in northern Vermont.*

And the results? During the first week of picking, the staked tomatoes outscored the caged ones in fruit per plant and yield per plant. Fifty percent more early fruit were picked from the two-stem staked plants than from the caged ones. No surprise there. Because the pruning limits the number of flowers on the plant, there's less competition. The early ripening may also be due to the physical stress of pruning. Stress always makes plants hurry to ripen fruit before they die.

For the same reason, in the final analysis the fruit on the staked plants was larger, by about one ounce per fruit. That's more than a ten percent difference.

In the end, though, the caged plants produced more than twice the tomatoes over the full harvest period. Each caged plant yielded an average of 21 pounds of fruit compared to nine on the single-stemmed plants and eight on the two-stem plants. Because the caged plants are unpruned, they produce much more foliage, which gives rise to more flowers and fruit.

Even before reading these results I had decided to use the two different methods for growing tomatoes.

I plant my early tomatoes in the warmest, sunniest spot in my yard, the bulb and flower bed up against the front of my house. I make sure there's room for



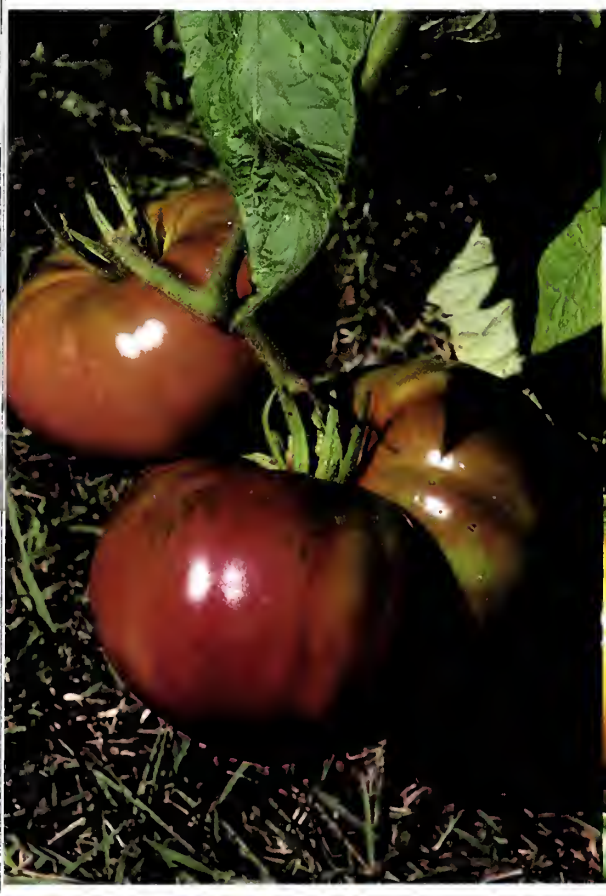
There are scores of tomato varieties, both heirlooms and hybrids. There isn't one best selection — the earliest tomato will never be the biggest or most flavorful. The answer is to try several varieties.

two or three plants between the drying bulb foliage and the emerging perennials. Instead of staking them, I run a pair of strings from the roof to the ground for each plant. As the plants grow, I wrap a stem around each string and pinch out the rest of the suckers.

My main-season crop is planted in cages in the vegetable garden. Besides providing a sturdy structure that can support the most vigorous of plants, cages provide one more advantage. As soon as the plants go in I wrap the cages from top to bottom with clear plastic. Not only does this warm the air inside, but it also cuts down on wind.

Wind causes all kinds of problems for young tomato plants. It bruises the sensitive plants. It breaks the stems. It decreases yield by causing the plant to devote energy into resisting the wind. And it gives rise to diseases: wind carrying particles of sand tears the leaves and makes ports of entry for disease, especially soil-borne bacterial diseases such as *Septoria*. Studies in New Brunswick have shown that adequate wind protection for tomatoes can increase total yield by about 15 percent and early yield by as much as 60 percent.

After preparing the soil with compost or manure, I lay black landscape mat



It's hard to beat the flavor of the heirloom Brandywine tomato.



Husky Gold is a new dwarf tomato suitable for growing in containers.

over the tomato bed. This material has it all over black poly. It's porous, so it allows rain and irrigation water to seep through and reach the soil (and the roots) under it. That's critical for tomatoes, especially if you've ever encountered blossom end rot.

Since I grow the tomatoes about three feet apart I measure that off and cut a hole about two feet in diameter in the mulch for each plant. Early- to mid-May I set the plants out, and drop cages of concrete reinforcing wire over them. Because I first cut the horizontal wires out of the bottom row, the long vertical wires can be stuck through the mulch and into the soil. (I also "weave" a broomstick or other pole through the cage and jam that into the ground.) Finally, I wrap the entire cage, right up to the top, with clear plastic. If frost threatens I can put another piece over top of the cage to protect them further. I leave the plastic on until the air temperature inside consistently cracks 90 degrees.



PHOTOS BY JUDY WHITE

Sweet 100 cherry tomatoes are probably the sweetest of all.

As the plants grow I mulch the bare soil around the stems with grass clippings. Every three or four weeks I lift the mulch and scratch some dried chicken manure into the soil. Occasionally I'll give them a foliar feeding of liquid seaweed or fish emulsion. With cages no pruning or tying is necessary, though if the plants get too lush I sometimes trim out the excess vegetation to let the sunlight in to ripen the fruit.

If frost threatens to shorten the season, as it did in the third week of August, year before last, I just haul out the plastic and rewrap the cages to protect the plants inside. Using this system last year I was eating home-grown tomatoes nearly into November.

I've found this dual system to be just about foolproof — if I've planted the proper variety.

After years of experimenting I've found my early varieties: Early Cascade and Johnny's 361. Others may beat them for sheer speediness, but nothing that I've found can top either (at least in my garden) for their combination of earliness, good fruit size, decent flavor and ability to keep producing all season long. In fact, Johnny's 361 was voted best tasting in a Rutgers taste test.

You might get some argument about that from some people. (No question about it, gardeners love to argue about the best-tasting varieties.) The consensus seems to be that the oldies are the



PHOTOS BY JUDY WHITE

Besides providing a sturdy structure that can support the most vigorous plants, cages can be wrapped with plastic to protect young tomato plants from damaging winds. Wind protection can increase yields by 15 to 60 percent.

goodies. It's hard to beat the flavor of open-pollinated heirloom varieties, those bred before shipability became the most desirable quality. Probably the one variety touted above all others is Brandywine. Its large fruit have an intense flavor known for its mix of sweetness and tanginess. Other favorites are Bonny Best, Pink Ponderosa and Tappy's Finest.

That's not to say that a variety has to be old and open pollinated to taste good. For flavor in a main-



Large areas of tomatoes are often left sprawled. Gardeners with limited

season tomato I still grow some of our farm favorites: the hybrids Moreton and Fantastic. And of course there's Sweet 100, the cherry tomato with probably the sweetest taste of all. But just because the fruits are small, don't think you can get away with growing it in a container. The plants get huge. If you're growing in pots you're better off with a determinate variety such as Pik Red or Toy Boy or the new dwarf indeterminate Husky Gold.



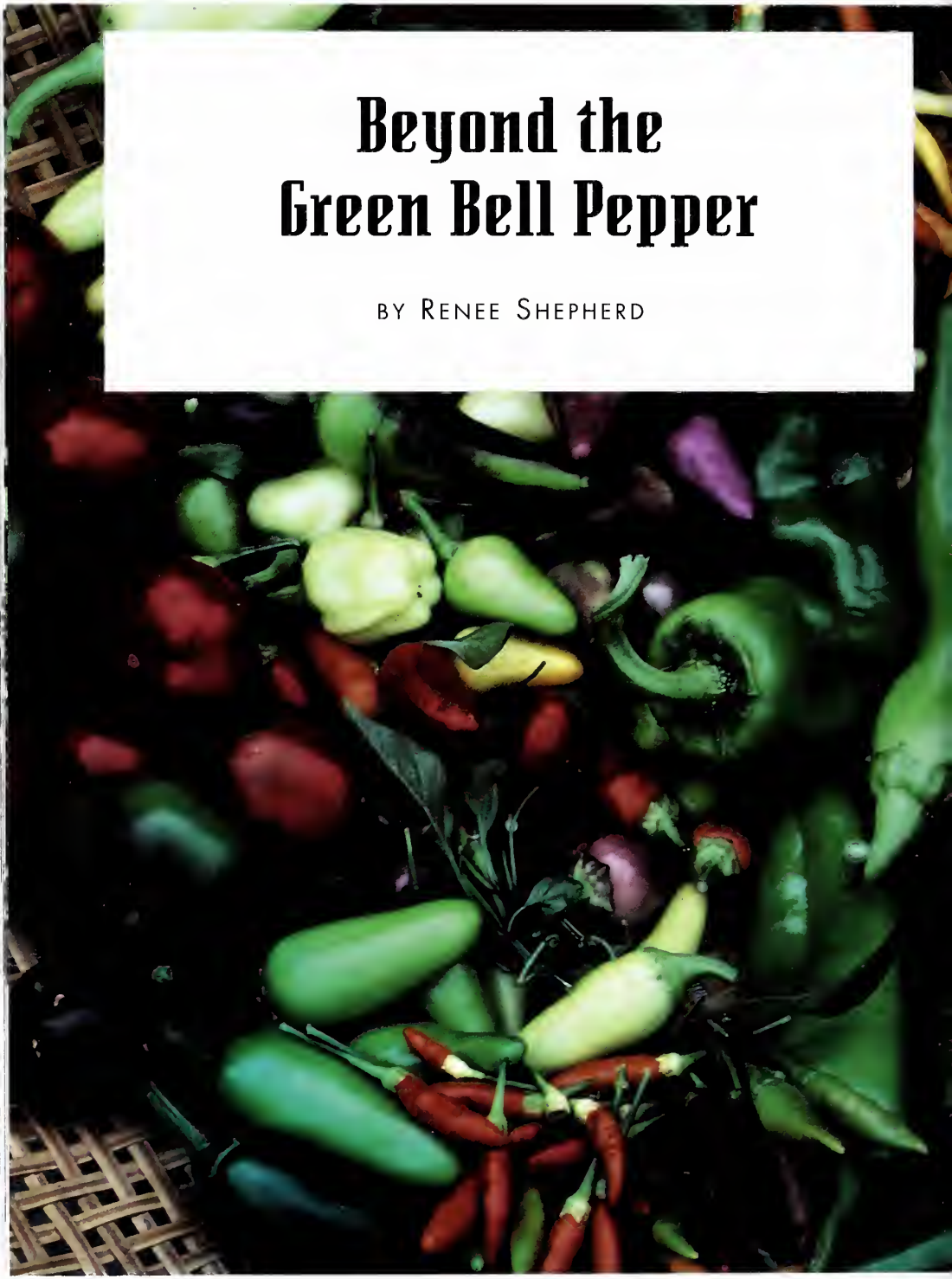
space should grow their tomatoes with stakes or cages.



In recent studies, tomatoes were grown with stakes and pruned regularly so that only one or two main stems remained. These plants produced earlier and larger fruits than their caged counterparts.

Beyond the Green Bell Pepper

BY RENEE SHEPHERD



Until a few years ago, when most Americans thought of peppers, they thought only of those squarish "green peppers" that are put in casseroles, or blanched, stuffed and baked. Or they ate them raw, and found them difficult to digest. Happily, all this is changing, and peppers of all types, sweet as well as hot, are finding a place in the garden. Originating in the New World, both hot and sweet peppers have found their way to almost every ethnic group around the world — from the tapered sweet frying peppers of Italy to the pungent sweet paprikas of Hungary to the tiny and hot spicy chiles of Thailand.

These prolific fruiting plants are lovely and ornamental, with shiny green foliage and pretty white blossoms. Pepper plants do well planted with annual flowers, and are quite handsome when grown in containers. While pepper seeds must be started indoors in most of the climate zones in the United States, their beauty and bounty make them well worth the extra effort.



ROSALIND CREASY

Hot peppers are much more diverse in appearance, flavor and intensity than most Americans realize.

Sweet Peppers

The varieties of sweet peppers available to the home gardener expands every year, spurred initially by the introduction of imported ripe red and yellow Dutch bell peppers for use by American chefs and home cooks who longed for a wider range of fresh vegetables and flavors. We've found out that the standard "green pepper" is actually an *unripe* pepper and will ripen to a deeper color and flavor. Today you can easily obtain seeds for peppers that ripen to gold, yellow, violet, purple, orange and even a rich chocolate color. These ripe colors are matched by the delicious full-bodied sweetness and the thick-walled crunchy flesh that characterizes mature peppers. They also have exceptionally high levels of beta-carotene and vitamin C.

There are several types worth considering for the home vegetable patch. The standard bell varieties come in a myriad of colors. They are usually somewhat blocky, with three or four lobes. All have thick flesh and are eaten raw or cooked. Roasting sweet peppers brings out their sweetness and adds a nutty flavor that is irresistible. Roast them over charcoal or under a broiler. Just brush with good olive oil first

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RENEE SHEPHERD *is founder and president of Shepherd Garden Seeds, a mail-order seed catalog company specializing in vegetable varieties chosen for the best fresh eating qualities. She travels to Italy and France regularly in search of new varieties, and one of her latest special interests is chiles, both hot and mild, from Mexico, Central America and the Southwest.*

HOW TO GROW PEPPERS

Peppers are a warm-weather crop and they need a long growing season, but starting them indoors will give them ample time to bear fruit in most parts of the country. Sow seed according to directions on the packet, in flats or peat pots filled with sterile soil mix about six to eight weeks before the average last frost date in your area. Peppers of all persuasions need consistently warm temperatures to germinate: about 80 to 85 degrees F is best. Keep seed flats or containers moist but not soggy in a warm place and expect germination in ten to 14 days.

Once seeds have germinated, seedlings immediately need bright light and can take cooler, 70-degree temperatures. Artificial fluorescent shop lights are a good way to provide light for seedlings; suspend them just an inch or two above the tops of plants and move them up as seedlings grow. If using a sunny windowsill, be sure to rotate plants and protect them at night when windowsill temperatures can plummet. Feed seedlings regularly once they get their first true leaves with half strength, all-purpose fertilizer. When plants are about two inches tall, thin or transplant to about three to four inches.

When danger of frost is past, night temperatures are consistently above 55 degrees F and the weather is warm and settled, it's time to transplant your pepper seedlings.

and grill until soft and tender. Then cool and remove the crisp skin.

Lamuyo peppers are more traditional European sweets. They are thick-walled and crunchy with very elongated blunt ends, about twice as long as they are wide. French, Spanish and Dutch gardeners routinely grow these varieties, which can reach six to seven inches in length and are just like American bells.

Eastern European sweet peppers tend to be less blocky and more pimento or heart-shaped, or even round and tomato-shaped. All are used at their ripe lipstick-red stage. The thinner-walled varieties can be dried for grinding up into the sweet full-bodied paprika powders used to flavor meats and vegetable dishes. Thick-walled varieties are often pickled and, as they are not readily available in American stores, it's particularly fun to grow these old favorites.

Bull's Horn frying peppers, also known as Corno di Toro, can grow up to eight inches long with pointed ends, and are traditionally used in Italian, Spanish and Cuban dish-

es. They have a thinner flesh than bell types and are sliced and quickly sauteed. These peppers are hard to find unless you live in an area with many Cuban or Spanish markets, but well worth cultivating at home.

Hot Peppers or Chiles

Chiles are also members of the *Capsicum* genus. Much more than simply hot peppers, chiles are far more diverse in appearance, flavor and intensity than many Americans realize — until we grow and enjoy them ourselves. Fresh chiles are much tastier than their canned or powdered cousins. They are surprisingly easy to grow in a wide variety of climates and deserve a larger following among gardeners. It's great fun to experiment with several new chile pepper varieties each season, and with the new interest in Asian, Creole, Cajun and Southwest cuisines, cooking with chile peppers has come into its own. Try mild, mellow-tasting chiles as companions to other vegetables, such as green

Plan ta set aut anly the stackiest plants with healthy, well-develaped raat systems. Pick a sunny spat with well-drained sail that has been amended with ample arganic matter. Harden aff your seedlings aver three ta five days ta get them used ta autdaar canditians. Da this by putting them aut in a protected shady spot far first a half day, then a full day, and then mave them gradually inta full sun. Try to transplant seedlings an an avercast day ar in the late afternaan to minimize stress. Space plants 18 inches apart; most peppers ar chiles will graw at least several feet tall and need ample raam. Plan to stake your peppers, as mast modern varieties have a branching habit and heavy fruit sets that will need suppart. Pepper plants are heavy feeders and shauld be fertilized frequently — at least ance a manth with a gaad all-purpase plant food or a cambinatian af fish emulsion and liquid kelp. They will respond well ta a thick layer af mulch applied when they are five ar six inches tall. Weed and water regularly and cansistently far best craps.

Harvest when fruits are large, glassy and thick-walled, and/or wait for the mature ripe stage when calar changes fram green and flavor is sweet and full. Ripe calored peppers are alsa the mast nutritious and best for roasting and eating out of hand. When harvesting, always cut, rather than pull, peppers fram the plant. Mast plants will bear until coal weather takes hald. Harvest regularly for maximum fruit production. Stare peppers in the refrigeratar in sealed plastic bags but bring ta raam tempeature befare using far best flavar.



ROSALIND CREASY

Today it's possible to obtain seed for sweet peppers that ripen to gold, violet, orange and other colors.

beans or corn, or with rice or pasta.

Experiment with the flavors of the hotter varieties in pastas, salsas and sauces. When you grow chiles, grow some of their favorite cooking companions — cilantro, corn, beans, garlic, onions, tomatoes, oregano, tomatillos and parsley — so that you have a full palate of flavors to work with in the kitchen. Freshly roasted, skinned and deseeded chiles can be frozen for year-round use, too. (Chiles, like all peppers, do not need blanching before freezing.) When working with chiles, it's a good idea to wear plastic gloves and avoid touching your eyes.

There is much confusion concerning the names of chile varieties. In their native countries, many have one name in their fresh state and another when dried. Sometimes the name depends on how a chile is prepared, or where it is from.

A good basic starting list of available varieties might include the following types to grow from seed:

- Poblano/Ancho, which are aromatic, mild, heart-shaped and deep red/brown. Called Poblano when fresh and Ancho when dried.
- Anaheim or New Mex chiles, also called California chiles. Very mild, six to seven inches long, thick-fleshed, rich and mellow in flavor. Delicious cut into strips and cooked with corn or beans.
- Cayenne, a general name for the thin, hot, dry and pungent pointed little chiles grown for use in French, Creole and Cajun cooking. Coarsely ground Cayenne chiles are also a familiar ingredient in pizza topping.
- Jalapenos, the familiar medium-hot to hot, thick-walled, three-inch-long cylindrical chiles used for a wide range of Mexican and Southwestern dishes.
- Serrano, very hot and spicy two-inch fruits that are very versatile fresh or dried in spicy South American and Asian dishes.
- Habanero, the hottest of the hot, have fiery bright-orange fruits shaped like little tam-o-shanter hats. (Caribbean habaneros are called Scots bonnets.) They are extremely hot and have a fruity quality to their spicy taste.
- Pepperoncini, wrinkly, three- to four-inch light-green or yellow, mildly pungent, thin-walled peppers. Pickle these for delicious, easy-to-make appetizers.

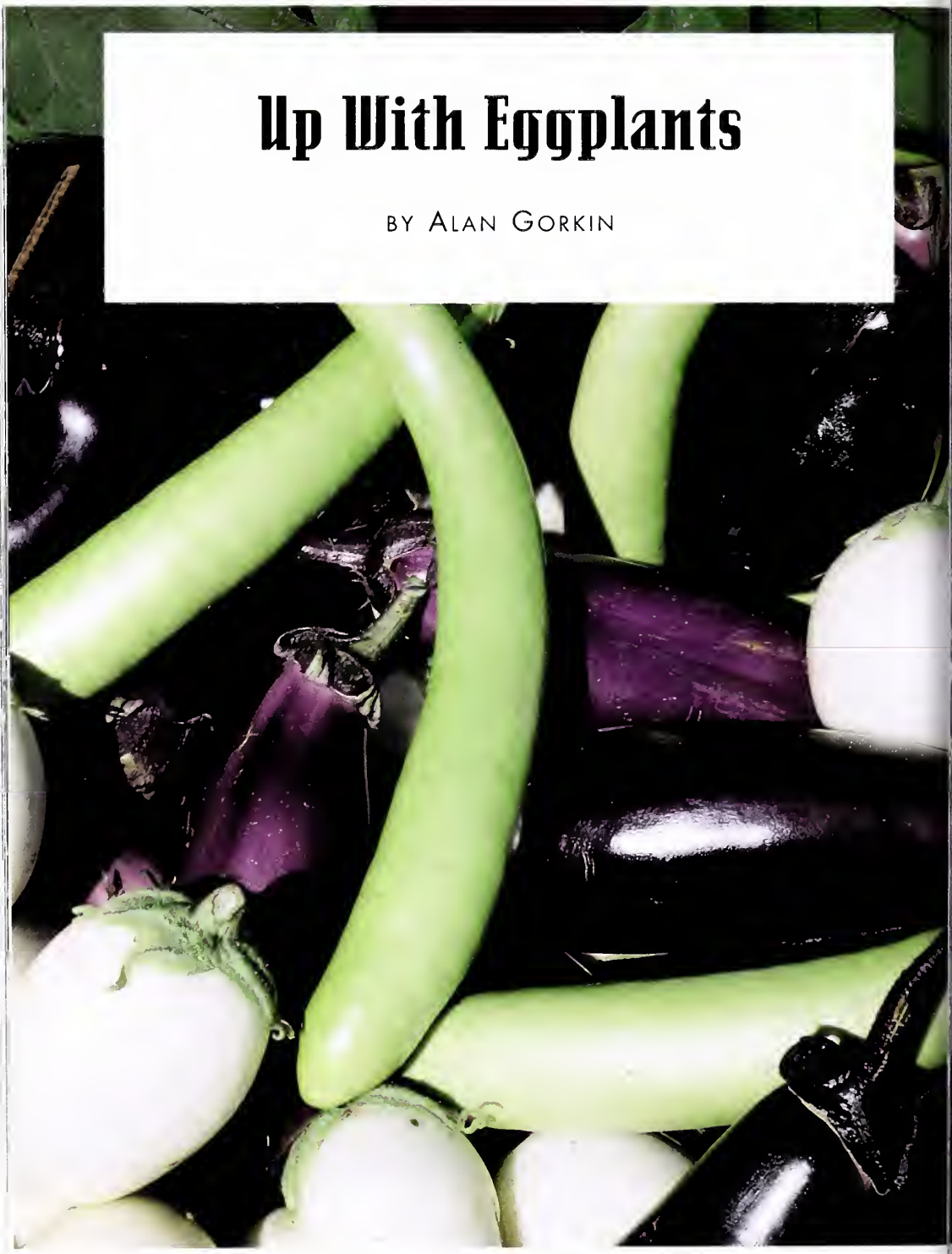
Once you begin to enjoy both the beauty and diversity of both chiles and sweet peppers, you'll want to try many more. There are literally hundreds of cultivars, and growing them opens up a window to the world's cultures and cuisines — a reward available only to the adventuresome gardener.



We've found out that the standard green pepper is actually an *unripe* pepper and will ripen on the vine to a deeper color and flavor.

Up With Eggplants

BY ALAN GORKIN



Tomatoes, tomatoes, tomatoes. Countless articles and books are available on how to grow the perfect tomato, how to stake, when to prune, what kind of heirloom varieties to try and on and on. But what about the lowly eggplant, also a member of the nightshade family, or Solanaceae? With all the reams of material about its cousin, eggplant, more precisely *Solanum melongena esculentum*, has been given a back space in the vegetable garden.

One reason for the situation is a lack of understanding about growing *aubergine*, as eggplant is known in Europe. Eggplants require an even longer season to mature than tomatoes and should be planted as mature plants for best results. Whereas tomatoes can be started five weeks prior to planting out in the garden, eggplant benefits from being started eight to nine weeks prior to planting.

An eggplant in a four-inch pot, well rooted and branched, planted in June in the New York area, for instance, will outperform any planted from cell packs in mid-May. Plants should be kept growing steadily indoors up to planting time with night temperatures above 60 degrees. Avoid crowding or stress from lack of water.

Prior to planting, harden plants off in a cold frame or sheltered spot for several days. When planting, space the plants according to vigor of variety, two to two-and-one-half feet apart in rows two-and-one-half to three feet apart. Subsequent care should consist mainly of weed control and watering. After the ground has warmed and hot weather arrives, this is best done by mulching. If mulch is not used, shallow cultivating will inhibit weed control, but exercise caution as eggplants are surface rooters and deep cultivation can cause harm.



JUDY WHITE

Eggplants now come in a variety of shapes and in white and violet as well as the traditional dark purple.

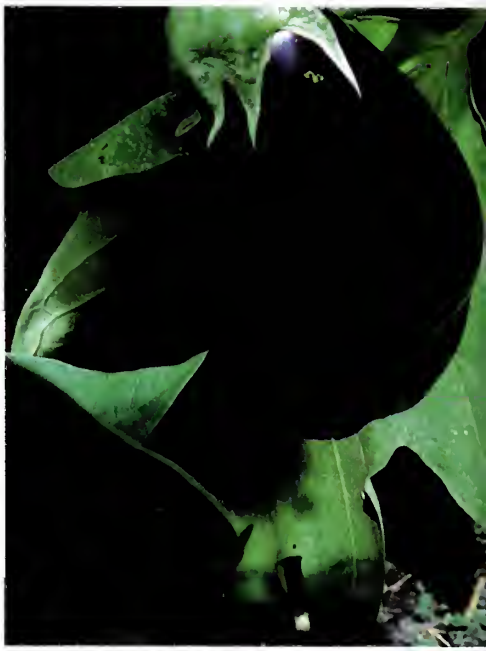
Watering is best accomplished by deep, periodic soakings to keep the large leaves from wilting.

Harvest the fruits anytime they have attained one third their mature size or until full-sized. To obtain larger fruits, restrict the number of fruits plants can set by removing about 25 percent of the flowers.

In my gardening experience, the main frustration with growing eggplant has been caused by planting too small a plant out too early. Eggplant and peppers (another solanaceous relative) will fare best when planted later as large plants.

ALAN GORKIN, *the former greenhouse supervisor at Old Westbury Gardens in Old Westbury, Long Island, is now the co-owner of Earth Garden, a florist, nursery and garden center in New Canaan, Connecticut.*





Eggplants require a longer growing season than even tomatoes do. For best results, plant mature plants, not cell packs, and plant them a bit late.

The second most annoying problem is insect pests. Flea beetles, small hard-shelled black beetles, can cause serious damage to the tender leaves of young eggplants.

Mexican beetle larvae and Colorado potato beetles are also quite damaging. Row covers, sections of finely woven fabric often used to extend the garden season, can also be loosely draped over newly placed plants to keep out marauding insects. As a bonus, the covers help the tender plants harden off and adjust to increased sunlight. The best preventive measure is to put out large, healthy plants. It never fails: the pests seem to know when I put out weaker young seedlings and set plants back even more.

If further remedies are needed, especially with the tiny and quick flea beetles, you may want to consider applying sabadilla dust according to the directions on the label. Made from the seeds of a tropical shrub in the lily family, sabadilla breaks down quickly, so plants can be treated up to one day prior to harvest. Look for larger insects such as beetle larvae at night with a flashlight and remove them by hand.

Many excellent eggplant varieties are available from seed catalogs. If you are unable to grow your own, buy healthy seedlings from a nursery and pot into four-inch pots. Classic varieties generally found in garden centers include Ichiban, an oriental variety with a lavender to purple, elongated fruit, and Dusky and Black Beauty, with dark purple, glossy, egg-shaped fruits. Grow them for several weeks before planting in the garden and you'll be rewarded with excellent eggplants. Slim Jim is another favorite of mine, but you may have to start this one from seed.

PHOTOS BY JUDY WHITE





SOURCES

THE COOK'S GARDEN
P.O. Box 535
Londondeery, VT 05148
Catalog $2 (refundable)

JOHNNY'S SELECTED SEEDS
Foss Hill Rood
Albion, ME 04910-9731
Catalog $1 (refundable)

SHEPHERD'S GARDEN SEEDS
6116 Highway 9
Felton, CA, 95018
Catalog $2 (refundable)

W. ATLEE BURPEE CO.
300 Pork Avenue
Worminster, PA 18974
Free catalog

PARK SEED CO.
Cokesbury Rood
Greenwood, SC 29647-0001
Free catalog

ELVIN MCDONALD

JERRY PAVIA

Essential Herbs

BY TOVAH MARTIN



Old-fashioned Sweet Basil



Curley-leaved Parsley

Although herbs may not have quite the nutritional impact of cabbage and squash, although they are not mentioned in the Five Basic Food Groups, they play a crucial role in the culinary world. Where would beans be without basil? Where would tomato paste stand without oregano? A dash of the right herb can coax peas down the gullets of recalcitrant children. Parsley gives a zing to drab baked potatoes; marjoram adds dash to string beans.

In the garden itself, they are wonderful companion plants. Just as the right herb can mellow a rutabaga, many herbs can soften the severe lines of the vegetable patch, forming a bridge between the flower and vegetable domains. Although you wouldn't think of planting a vegetable just because its leaves are blue or its flowers purple, herbs are a different story.

Since herbs already have a reputation based partly on their physical attractions, the temptation to add further visual delights is irresistible. In addition to the standard varieties, hybridizers have engineered variations on the theme: curly parsley, golden sage, purple fennel, creeping oregano, miniature basil and many others. Even if you never eat a single sprig of parsley, you might want to add herbs to the scene simply to relieve the tedium of the vegetable bed.

Although it's been a few centuries since we relied upon herbs for medicine and antiseptics, some are still essential. I can easily live without lovage and I can survive without chervil, but parsley, basil, savory, thyme and oregano are part of my daily diet.

Parsley is a must. I prefer curly parsley rather than the broadleafed Italian type, which tastes too close to celery for my palate. And curly parsley is one of the most ornamental edible herbs in the garden. Lined up in a row (leaving six to eight inches between plants), it makes a fluffy, compact mini-hedge that might even dissuade intruding critters (rabbits love parsley). Swallowtail caterpillars prefer parsley over carrot tops, so planting a lot of it may save your winter crop of root vegetables.

In our Connecticut garden, we start parsley in the greenhouse in February, right along with celery and celeriac. Most herbs germinate in a jiffy, but parsley bears out its bad reputation — that the devil goes to hell and back seven times before this seed will germinate. A toasty environment (65 degrees F) and a lightly moist seed bed will help speed things along, but it's wise to plant seeds indoors if you plan to harvest parsley by summertime. And plant plenty. French, Italian, southern and all sorts of other ethnic recipes call for a handful of parsley to liven up the fare.

Basil is next on the agenda. Most people stick with the plain old *Ocimum basilicum*, the sweet basil you find for sale next to the tomatoes on supermarket seed stands. It's actually the best of the basils, in my opinion. When a recipe calls for basil, chances are that *O. basilicum* is what they have in mind.

And while gourmet seed companies now list half a dozen or more basils with fancy foreign names and tantalizing descriptions, in my experience, most don't live up to their billing: lemon basil has a weak growth habit, lettuce-leaf basil rapidly becomes woody, Fino Verde Compatto

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TOVAH MARTIN, *is the coauthor of* Keeping Eden *(Bulfinch, 1992) and the author of* The Essence of Paradise *(Little Brown, 1991),* Moments in the Garden *(William Morrow, 1991) and* Once Upon a Windowsill *(Timber Press, 1988). She is also the staff horticulturist at Logee's Greenhouses, in Danielson, Connecticut, where she and her family grow an acre of vegetables and herbs in their garden.*

tastes like boiled spinach. And who wants to eat camphor basil? The best, in my opinion, are Minimum, Napoletano (alias Mammoth), Green Ruffles and, of course, the no-frills sweet basil.

Although you might add basil frequently to the frying pan, don't go overboard planting basil in the garden. One plump plant, given plenty of room and abundant sun, will easily produce a year's supply of basil if you keep it pinched to promote branching.

On the other hand, you need lots of summer savory. Savory is sort of a bland herb, so you can throw it in casseroles by the handful. But it's a tiny, sprawling affair with rather handsome white flowers scattered among the thin leaves — so the harvest is scant. And because summer savory doesn't rejuvenate after being plucked, we usually plant several crops to keep it coming for meals. Winter savory has earned fame as a perennial counterpart, but though it's just as handsome, it isn't half as tasty.

When there's fresh thyme on hand, it seems as though everything we eat is seasoned with a generous helping of it. English broadleaved thyme, *Thymus vulgaris*, is my favorite for cooking. The leaves are large enough to make a difference tastewise, but they're small enough to be thrown into the pot without dicing. You can also harvest thyme to your heart's content



ELVIN McDONALD

Dwarf oregano, left, and golden oregano, right. Oregano and marjoram are so closely akin that they've become almost synonymous.



TOVAH MARTIN

Summer savory is a subtle herb and doesn't rejuvenate after being plucked, so plant several crops to keep it coming all season long.

and never make a dent in the plant's bushy mass of little leaves. In addition to being user-friendly, *Thymus vulgaris* is perennial. For the best harvest, cut the old branches back to the base in spring, giving the young growth plenty of room to sprout anew.

Oregano and marjoram are so closely akin (both are members of the genus *Origanum*) that, to tell the truth, they've become almost synonymous. *Origanum vulgare* is called both marjoram and oregano in mail-order catalogs and at nurseries. Technically it is wild marjoram and not the best for cooking. *Origanum onites* and *O. majorana*, the gourmet's choices, also share the common name of marjoram, much to the confusion of everyone. The true culinary oregano is *Origanum heracleoticum*, with that inimitable pungent flavor. To get around the confusion with common names, I suggest that you grow several varieties and cook with them according to your taste. They all require sun and they all make neat little mounds in the garden. *O. majorana* is a rather short-lived annual; the rest should survive the winter outdoors, although they can be tilled up with the rest of the garden, replanted and still yield an impressive harvest. All origanums are pungent herbs: a little pinch is enough to add zing to pasta. So don't put in half an acre of either marjoram or oregano but do tuck in a few plants close to the beans.



PHOTOS BY CATHY WILKINSON BARASH, EXCEPT WHERE NOTED

Edible Flowers

BY CATHY WILKINSON BARASH

For years most gardeners were separatists. They fenced in the homely vegetables in the backyard and gave free rein to ornamentals in the front. Commingling of flowers with vegetables or fruits was strictly taboo. As a young child, I railed against these constraints and was always sneaking in some single French marigolds or calendulas with the tomatoes. To my mind, the yellow flowers not only contrasted nicely with the red tomatoes, they also matched the color of the tomato flowers.

Today, of course, many people mix flowers with vegetables, especially those that are edible. You may be growing some already without even knowing it. Pea flowers (not sweet pea, a poisonous ornamental) have a bright, pealike flavor. The flowers are attractive white or purple. Scarlet runner bean flowers are bright orange, contrasting nicely with their cousins, white Dutch runner beans, which have white flowers. Their flavor, unsurprisingly, is reminiscent of the beans. Squash blossoms, used traditionally in Italian cuisine, have also long been a delicacy of Native Americans. Their mild flavor is the perfect foil for stuffing and frying using cheeses, herbs or even meat.

And consider the lowly dandelion, condemned by most as the scourge of the perfect lawn. Grown organically (as all edible flowers must be), the flowers can not only be made into a delectable wine, but their sweetness is a nice addition to an omelet. Once again, the Native Americans appreciated these flowers, making fritters from them.

Edible flowers add color both to the vegetable garden, which can be boringly green, and to the food with which they are served. Some have bright, vibrant colors and flavors to match; others are more delicate, both in color, flavor and size. Most of the culinary herbs have flowers that are edible. And an added bonus for many of the herbs is their ability to ward off winged pests. So consider some of the following — to brighten your vegetable garden as well as your culinary palate.

CATHY WILKINSON BARASH *is a garden writer, photographer and gourmet cook. She has been gardening and cooking since childhood and is the author of* Roses *(Chartwell, 1991) and* Edible Flowers from Garden to Palate *(Starwood Publishing, 1993).*


Calendula & Daylily


Chives


Carnation & Rose

VARIETIES

Common Name	Botanical Name	Color	Flavor
Anise hyssop	*Agastache foeniculum*	Mauve	Licorice
Artichake (eaten immature)	*Cynara scolymus*	Green	Artichoke, floral
Arugula (racket)	*Eruca vesicaria*	Off-white	Spicy, peppery
Basil	*Ocimum basilicum*	White, mauve	Spicy, basil
Bean, scarlet runner	*Phaseolus coccineus*	Red-arange	Beany, floral
Bean, Dutch white runner	*P. coccineus* var. *albus*	White	Beany, flaral
Bee balm	*Monarda didyma*	Red	Sweet, hot minty
Borage	*Borago officinalis*	Blue	Sweet, cucumber
Braccali	*Brassica* spp.	Yellaw	Mustard, spicy
Calendula (pat marigald)	*Calendula officinalis*	Yellaw, arange	(used for colar) Mild vegetal (imparted in caoking)
Chives	*Allium schoenoprasum*	Mauve	Chive



Garlic Chives



Chard, Dill & Johnny jump-up



Lavender

Common Name	Botanical Name	Color	Flavor
Chrysanthemum	*Chrysanthemum* x *morifolium*	All colors	Variable, bitter
	'Shungiku'	Yellow, white	Mild
Clove pink	*Dianthus caryophyllus*	Pink	Clove, floral
Coriander	*Coriandrum sativum*	White	Herbal
Daylily	*Hemerocallis* spp.	Yellow, red, orange	Mild, vegetal, sweet
English daisy	*Bellis perennis*	White, pink	Mild vegetal
Garlic chives	*Allium tuberosum*	White	Garlic
Honeysuckle	*Lonicera japonica*	White, yellow	Floral, sweet
Hyssop	*Hyssopus officinalis*	Blue, pink	Slightly medicinal
Johnny jump-up	*Viola tricolor*	Purple, white, yellow	Mild, peppermint
Lavender	*Lavandula* spp.	Purple	Herbal, perfumed
Marigold	(especially *Tagetes tenuifolia* 'Lemon Gem', 'Tangerine Gem')	Yellow, orange	Floral, tarragon



Nasturtiums

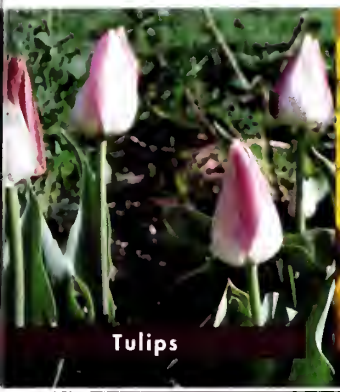


Viola 'Cuty'



Chervil, Geranium & Roses

Common Name	Botanical Name	Color	Flavor
Marjoram	*Origanum majorana, O. vulgare*	Pink, lavendar	Herbal, strong
Mint	*Mentha* spp.	White, lavender	Minty, sweet
Mustard	*Brassica* spp.	Yellow	Hot, mustard
Nasturtium	*Tropaeolum majus*	Yellow, red, orange	Peppery
Nodding onion	*Allium cernuum*	Pink	Spicy, oniony
Oregano	*Origanum vulgare*	White, pink	Herbal, savory
Pansy	*Viola* x *wittrockiana*	All colors & mixed	Mild to wintergreen
Pea (garden)	*Pisum sativum*	White, lavender	Pealike, floral
Pineapple guava	*Feijoa sellowiana*	Cream, fuchsia	Sweet, floral
Pineapple sage	*Salvia elegans*	Red	Sweet, herbal
Pinks	*Dianthus* spp.	White, pink, red	Mild vegetal to sweet spice
Radish	*Brassica* spp.	Off white, pink	Mustard, spicy


Tulips


Squash Blossom


Carnation & Thyme

Common Name	Botanical Name	Color	Flavor
Red clover	*Trifolium pratense*	Pink	Sweet-strong
Rase	*Roso* spp.	All but blue	Mild floral, varies
Rasemary	*Rosmorinus officinalis*	Pale blue	Herbal
Sage	*Solvio officinolis*	Blue, purple	Herbal, varies
Savary, winter	*Sotureja montono*	White	Herbal, spicy
Scented geranium	*Pelargonium* spp.	Pink, red, white	Variable
Saciety garlic	*Tulboghia violoceo*	Pink	Garlic
Squash blassoms	*Cucurbito pepo*	Yellow	Mild, vegetal
Thyme	*Thymus* spp.	White, pink	Herbal, varies
Tulip	*Tulipa* spp.	All colars	Mild flaral, bean ar pealike
Violet	*Viola odoroto*	Vialet, white	Mild perfume
Yucca	*Yucco* spp.	White	Sweet, mild vegetal



FELDER RUSHING

A Cornucopia of Corns

BY FELDER RUSHING

My dad once stumped some Northern city boys about where the seed for those tiny pickled ears of corn found at salad bars came from. To this day, some of them still think that's what grits are.

What Americans call corn (*Zea mays*), internationally known as maize, is much more than a block of vertical plants in the garden. Being the most efficient of the major grains in transforming the sun's energy into food has made corn one of the four most important food plants on Earth.

About one-half of the world's sweeteners come from corn, as do literally thousands of other products including automobile fuel, cooking oil, beer, corn chips and taco shells, cornbread, millions of cans of whole kernel or creamed corn and, of course, Orville Redenbacher's popped stranglehold on moviegoers. Even a disfiguring corn ear disease called smut (a truly ugly fungal growth) can be eaten as a delicacy.

The importance of corn to the world and its fascinating history are as interesting as growing it is easy: all it takes is sun, seed, fertilizer and water, in about that order. But those top varieties featured in your favorite mail-order catalog or garden center are the result of thousands of years of slow domestication and crude varietal selection. Cultivated as early as 3500 B.C., perhaps the earliest corn was Teosinte, a wild grass with small tassels and diminutive spikelets of seeds.

Corn was one of Christopher Columbus's most important "discoveries." After its introduction to Spain, corn was found cultivated in Africa by 1550. Because of its

JERRY PAVIA

FELDER RUSHING, *a seventh-generation Mississippi gardener, is a garden author, photographer and lecturer. He hosts gardening shows on radio and TV and is a frequent contributor to Brooklyn Botanic Garden's handbooks.*

high caloric value, it helped in enabling European and African populations to swell, and fueling great social changes. The real impact of corn on people, however, was in the livestock arena. Humans ate only the seed of corn; cattle could digest the entire plant. This discovery quickly increased not only the meat and lard supply, but also that of milk, cheese and butter.

Before the early 1800s, people ate mostly young, tender field corn; it has been only in the past couple of hundred years that the sweet corns of today have been widely grown. Corn is now categorized by its color: white, yellow and bicolor (yellow and white kernels on the same ear). Varieties are divided also into those that mature early (in 65 to 70 days), midseason (70 to 80 days) and late (80 days plus). Early varieties are best for northern states; they generally do not make satisfactory growth or ear size in the South.

Super sweet corn is crisp and watery, has four or five times the sugar content of the others and has a slow conversion rate of sugar to starch. Its seeds are small and the plants are slower to establish in the garden than other kinds. However, the ears — which can be eaten raw right in the garden — hold up well on plants and in the refrigerator.

Because the modern marketplace demands a high yield and large, uniform size in corn (or any other commercial vegetable variety), only a few dozen varieties are generally planted each year. The very real risk in this lack of diversity is in susceptibility to disease and other unexpected disasters (prolonged drought, late frosts and so on). For this reason, researchers are trying to identify and maintain for future generations a more diverse gene pool.

From its wild and weedy grass ancestors, we now have 35 or so distinct races of corn, with seed of 11,000 genetically different kinds in storage today in international seed banks.

In addition to the recent interest in such heirloom corn varieties as Santo Domingo Blue (the blue corn of Southwestern cuisine), there are old standbys for every



Corn needs plenty of sun, water and nitrogen fertilizer to grow properly.



FELDER RUSHING

The most efficient of the major grains in transforming the sun's energy into food, corn is one of the four most important food plants on Earth and inspiration for countless cooks — and architects.

region. For your area, any local seed store will carry the most popular kinds (better or worse); the cooperative extension office will have a list of recommended varieties, based on local research. Seed catalogs offer the latest varieties as well, usually with performance comments. Almost all seed sources now carry the normal sweet kinds, sugary enhanced sweets and super sweets.

Over the years, breeders have found that different varieties of corn can tolerate extremes in climate — from the rocky soils of New England, across the muggy Mississippi Delta, to the high, arid southwestern mesas and even to the short, cold seasons of Alaska. Try a new variety or two each year, along with your favorite standby.

Corn seed should be planted after danger of a late frost is past and covered an inch or so with soil. Thin plants to six to 12 inches apart. Plant in blocks of rows for the best pollination. Corn requires more water than most other vegetables: irrigate during dry spells, especially during pollination. Hot, dry conditions during pollination can cause missing kernels, small ears and lower quality.

Corn is a greedy grass which benefits from a regular, even supply of nitrogen fertilizer. Since commercial (chemical) sources of nitrogen generally leach away quickly with irrigation or heavy rains, most gardeners give their corn two side-dressings of nitrogen — one when the plants are a few inches tall and again when knee high. Slow organic fertilizers and compost help smooth out the ride, giving a gentler, steadier feeding than the "feast and famine" of chemicals.

The ancient Mexican method of planting corn, beans and squash together made lots of sense — beans and squash climbed up the cornstalks, while aiding retention of nitrogen. Together they helped keep the soil fertile and arable.

For an ear of corn to develop, powderlike pollen from the tassel at the top of the plant must fall to the sticky silks of the ear, located about halfway up the stalk. This is why corn is best planted closely in several rows, so that pollen won't blow away on windy days. Planting different varieties of corn close together, if they shed pollen at the same time, can cause cross-pollination, resulting in lowered quality or scattered kernels of a different color. Consequently, it is best to separate corn varieties by either distance (several yards, with other vegetables in between) or by maturity time (planting early with late varieties is generally alright).

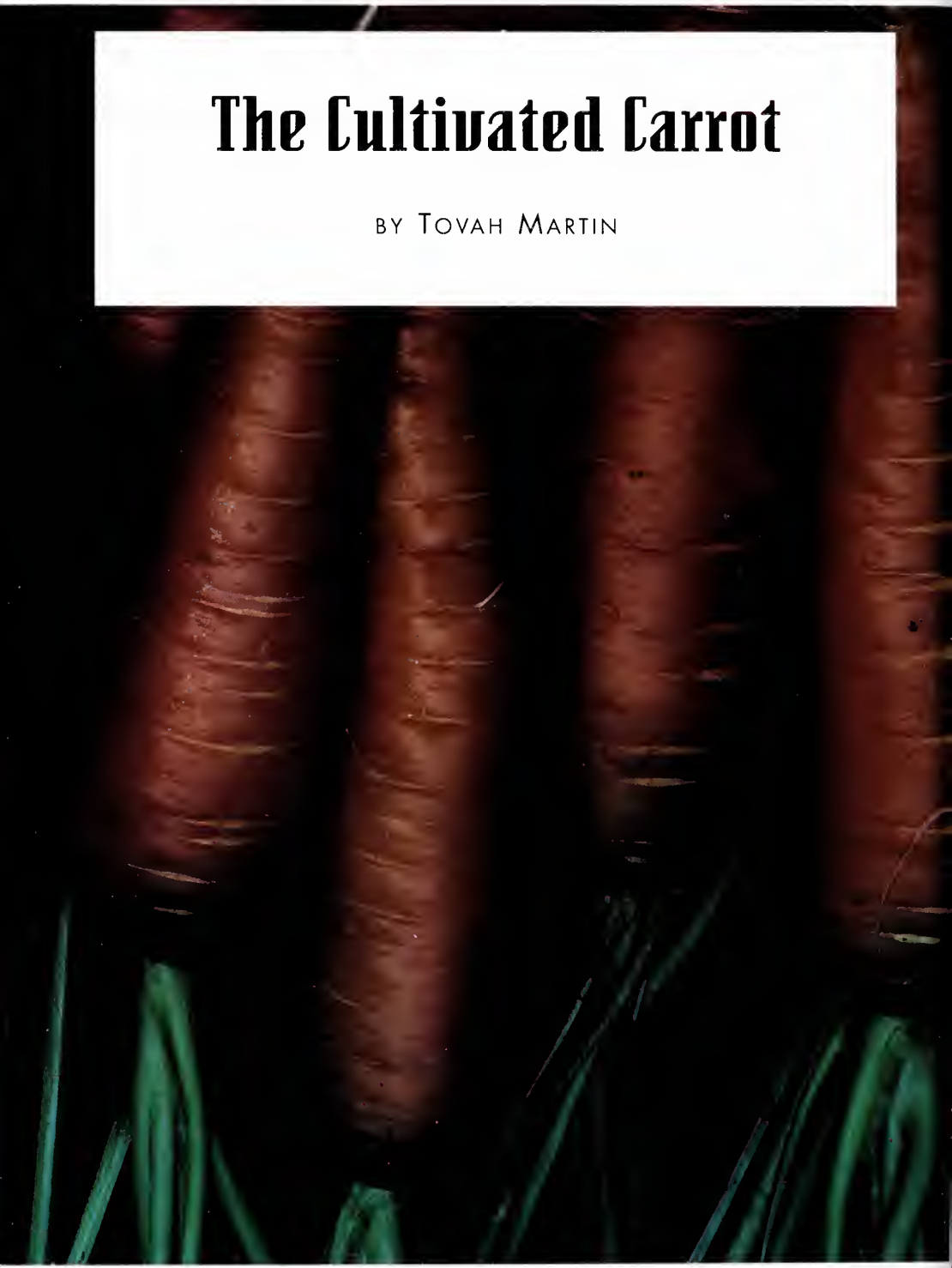
Pests of corn include earworm, chinch bugs, armyworms, birds and raccoons. Short of using lots of chemicals or following sometimes hit-or-miss natural controls (interplanting with other vegetables and so on), not much can be done to control these creatures. I've heard of farmers-market customers who actually look for a few worms to be sure the corn hasn't been oversprayed with pesticides. Planting lots of corn in several blocks throughout the garden may help reduce overall damage. If a chemical control is needed for earworms (I choose not to use any, and generally get by all right), keep in mind that only the silks need to be treated, and then only for the couple of weeks they are fresh and susceptible to infestation.

Make a note when you first see silks appear from the tips of little ears that the final harvest is generally just under three weeks away. Silks will be withered and dark, ears full and kernels plump and milky-juicy (again, supersweets have clear, watery juice). To harvest, pull down and twist the ears — they'll pop right into your hands. To prevent sugars from rapidly changing to starch, eat or process corn as soon as possible.

By the way, those miniature salad bar cobs are simply immature ears harvested at first signs of silking time, before they can be pollinated. But then what are grits?

The Cultivated Carrot

BY TOVAH MARTIN



Carrots are not top-priority vegetables. When it comes to the hierarchy in the vegetable patch, carrots are ranked right down there alongside potatoes and rutabagas.

But carrots were not always underdogs. In 1603, John Gardiner proclaimed, "if... any city or town be besieged with the Enemy, what better provision for the greatest number of people can be than every garden be sufficiently planted with carrots?" Apparently, the early European settlers in North America were of the same mind, because carrots were among the first vegetables to arrive in this country. Some people claim that Johnny Appleseed carried wild carrot seed with him to scatter on his planting mission throughout the country.

At the time, cultivated carrots were just a step above the wild species from Eurasia. Over the centuries, gardeners selected varieties of *Daucus carota* with a sweet orange taproot while also enhancing its taste and keeping quality. In fact, in the carrot world, the old standbys are still the most popular market varieties. 'Scarlet Nantes', 'Spartan Early' and 'Royal Chantenay', with their long, straight roots and good storage qualities, continue to lead the pack just as they did decades ago. 'Pioneer' and 'Six Pak' have also been around for years and are still valued for their uniform, tender and sweet roots.

Although we aren't inundated with new cultivars, there are some novelties on the market. 'A-plus' is a recent USDA introduction from Wisconsin boasting reddish flesh and an elevated Vitamin A content. 'Trophy' is a very long, slender hybrid with excellent taste, but it tends to break during digging. Several short, stubby, bite-sized hybrids are now available such as 'Kinkol' and 'Parmexl'. But in my opinion, they just don't give you enough carrot for your labor.

Actually, a carrot's quality has more to do with the weather than the name on its seed packet. Carrots are a cool-weather crop. In fact, germination is best when soil temperatures are between 50 and 80 degrees. No matter how carefully you prepare the soil, sprouting will be sporadic when the weather is either too cold or too hot, and the roots develop poorly when the mercury soars.

Equally important to your carrot crop is good, deep, rich soil. Obviously, a plot that is riddled with rocks will impede the downward thrust of your carrot roots, and debris on the soil surface can prevent the tiny sprouts from ever reaching light. So, the first step toward a good crop of carrots is tilling and raking the bed carefully.

The fashion at the moment is to plant carrots in raised beds, and this method works well if you have a small plot to plant. But if you plan to sustain cities with your crop or just feed a family of four over the winter, rows are much easier to weed, harvest and cultivate.

Serious carrot eaters should space their no-nonsense rows two feet apart, allowing ample room for cultivation with a wheel hoe. Plant your carrots shallow and thick — scratching the earth with a hoe handle, sprinkling the seed in the groove and then covering it up with a quarter inch of fine soil.

Even in the best weather, carrot seed germinates lethargically and unreliably. To compensate, it is wise to oversow. Actually, it's nearly impossible to carefully space those tiny seeds the optimal quarter inch apart unless they have been pelleted (coated) for easy handling.

Early carrots can go into the ground in spring along with the first peas. By

mid-June, before the weather becomes unbearably hot, the second crop should be safely in place. With a little luck, that crop will keep your family supplied with carrots throughout the winter.

A drought will coincide with your June planting; you can set your watch by it. Watering the carrot crop is a tricky business by anyone's standards, but carrots must have moisture to germinate. A light, gentle rain is ideal, and that is what usually coincides with the spring crop. But in early summer it's either feast or famine in the water department; a sudden cloudburst can drop buckets of water on your fall planting and wreak havoc with the shallowly sown seeds. More often you'll be doing a rain dance — pray for *gentle* precipitation — but if that doesn't work, get out the sprinkler.

Carrots grow slowly at first, especially if the weather is hot. In a searing, dry season, they tend to make pithy, tasteless, pale roots. Of course, you can't do a thing about the weather, but auxiliary watering will increase the soil's moisture content while decreasing the temperature.

Carrots should be thinned to an inch apart immediately upon germination. It's a tedious and sweaty job, but it works wonders with visiting houseguests who have overstayed their welcome. As the roots begin to mature, gradually thin the carrots again to two inches apart using the culls as fingerling snacks.

Carrots are troubled by few pests. Wire worms occasionally make inroads into their roots and nematodes sometimes cause knotty growths on the flesh. Swallowtail caterpillars occasionally dine on a carrot sprig or two. But they do no serious damage and can easily be tolerated in view of their beauty.

Large critters usually pose much more of a threat to the crop. As we all know, rabbits love carrots (they nibble the tops, by the way; I've yet to see a bunny pull a carrot up by the roots and munch away Bugs Bunny-style). Deer can also be a nuisance. Try putting dishes of moth balls (naphthalene) beside the field — the odor should successfully keep everything and everyone at bay.

Carrots are ready for harvest when the roots are about one to one and one-half inches thick. Generally, 55 to 65 days will elapse between germination and maturity. The spring crop often becomes pithy and occasionally goes to seed if left in the ground through hot weather, but the fall crop can stay in the ground throughout the winter. In fact, carrots can be harvested despite the temperatures outside if a thick layer of hay is spread over the bed. Although the traditional method of harvest is simply to pull the crop up by its frilly tops, a preliminary loosening with a spading fork will ease the toil and minimize root breakage.

Carrots can be canned or frozen, but the easiest way to store a large carrot crop is in a root cellar. We line wooden apple crates with sheets of plastic and alternate layers of carrots with moist long-fibered sphagnum moss. Then the crates go into a cellar that remains barely above freezing. If you don't happen to have a root cellar handy, carrots will last for several months in the refrigerator.

Carrots are one of the finest sources of Vitamin A in the vegetable kingdom, with the exception of steamed turnip greens. Tastewise, turnip greens do not compare, and they are certainly of no use as a winter storage crop. In fact, when your garden is nothing but a mound of snow, carrots are still supplying salad with a little spark of color. ◘





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Great greens

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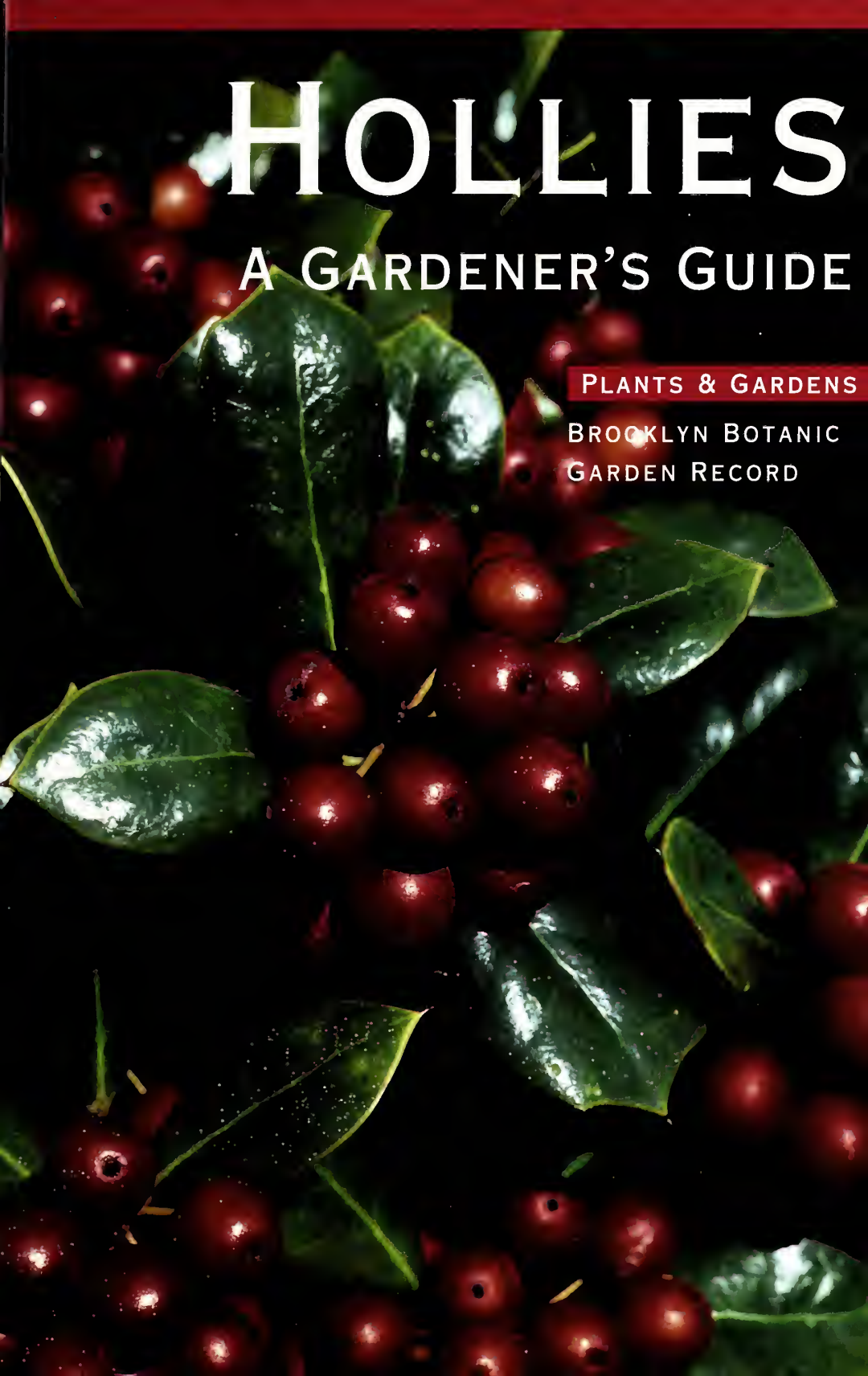
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A Gardener's Guide

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1993

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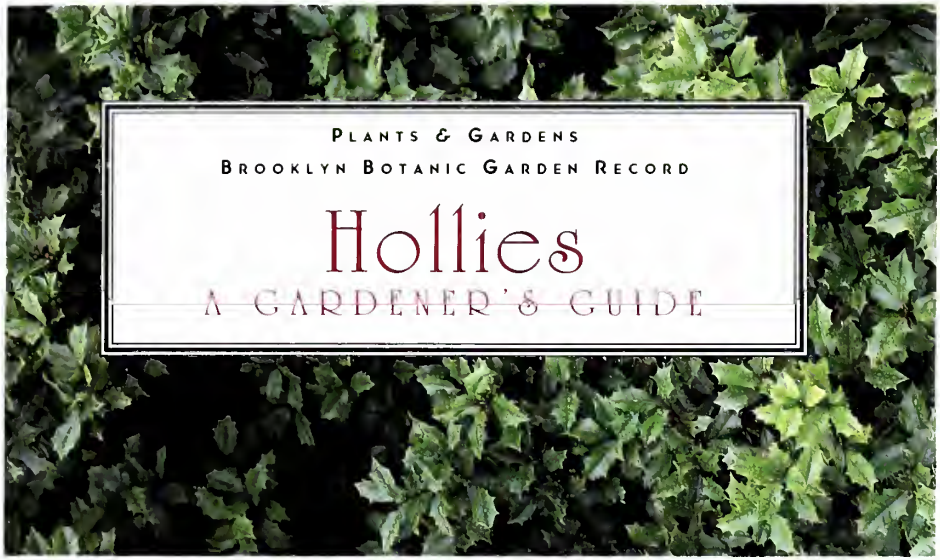
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Hollies

A GARDENER'S GUIDE

VOL. 49, NO. 2, SUMMER 1993

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Introduction

Whosoever against Holly do sing,

He may weep and his handys wring.

FROM A 15TH CENTURY CAROL

Heigh ho! sing heigh ho!

unto the green holly.

SHAKESPEARE

Of all the trees that are in the wood,

The holly bears the crown.

ANONYMOUS

Holly is woven into the lore and legend, romance and religion, medicine and music and rites and rituals of many peoples on at least four continents and a bunch of islands.

Today, few in this country brew holly tea or other holly beverages. Midnight dances around moonlit holly trees are infrequent.

Instead, we use holly in the landscape in myriad ways; we train dwarfish hollies into bonsai; we work holly into wreaths and other arrangements.

The increasing interest in holly, both the evergreen and the new deciduous varieties, prompted the production of this handbook.







Frederick Douglass wrote in 1876, "If there is no struggle, there is no progress."

The struggle is accomplished. And it could not have been accomplished without the help of the Holly Society of America and the efforts of the following holly experts:

Harry William Dengler	T.R. Dudley
Michael Ecker	G.K. Eisenbeiss
Fred Galle	Dorothy B. Grosse
Gordon Jones	Patricia Joseph
E. Elizabeth Kassab	William N. Kuhl,
Richard Lawson	Virginia Morell
Dr. Elwin R. Orton Jr.	Matthew C. Perry
Robert C. Simpson	Carl W. Suk
Alice Wieman	John Wieman

To them our heart-felt thanks.

As for progress, if one reader, just one, learns something about the genus *Ilex* and/or gains pleasure from this book — that is *not* enough! So much love and other good stuff went into this book that we expect thousands of people to learn about holly and be happy about holly.

To wit, we've avoided technical terminology and arcane jargon as much as possible, though for the sake of top-shelf accuracy, they occur sometimes. Case in point: the sexually reproductive plant part of a (female) holly, botanically correctly, is a fruit. Ultimately correctly, it is a bacco drupe. Often in these pages the thing is called a berry, and we all know what it is without feeling sophomoric about it.

This book is by holly people, for holly people and for people who may wish to be holly people. The "bys" have written; the "fors" may now read. Please.

Heigh ho!

Alan D. Cook
Guest Editor

Alan D. Cook *is Director of Extended Services at the Dawes Arboretum in Newark, Ohio.*



American holly, *Ilex opaca*, is a hardy evergreen native to the eastern United States. It can grow to 50 feet tall or more. Its abundant, berrylike fruits come in all shades of red and orange as well as yellow.

What Makes a Holly a Holly?

When most gardeners think of hollies, they think of the American, English, Chinese and Japanese shrubs and trees that adorn parks and gardens. Yet hollies are widely scattered around the world, in both temperate and tropical regions of both hemispheres, and are native to every continent except Antarctica. There are between twenty and thirty species in North America alone. Most hollies occur naturally as trees and shrubs, but there are also a few climbers and epiphytes.

A number of hollies are known as "caffeine hollies" because indigenous peoples where these species are native infuse the leaves to brew a beverage that has a stimulating effect. Probably the most famous of these is yerba maté, made from *Ilex paraguariensis*, a tree native to subtropical forests of Paraguay, Argentina and Brazil. When Europeans first arrived in the Southeast, they discovered that a tea made from the leaves of the yaupon holly, *I. vomitoria*, was made by Native Americans along the Atlantic and Gulf coasts from Virginia to Texas.

All hollies fall into two broad categories: evergreen, those that retain their leaves throughout the year, and deciduous, those that lose all of their leaves during the dormant season. Gardeners have been singing the praises of the evergreen types for centuries. In recent years the deciduous hollies have begun to come into their own. With waxy fruits in shades of red, orange and yellow that cover the naked branches and persist for weeks, these plants are stars in the winter garden.

Hollies differ widely in their physical characteristics. Plant breeders have taken advantage of this variation to produce hundreds of new cultivars and hybrids.


American holly
in fruit
A spring
flowering branch



Flowers

Holly flowers are usually dioecious, meaning that male and female flowers are on separate plants. The flowers are white, cream, green, pink or lavender. There are usually four sepals, petals and stamens; sometimes five to nine. Flowers are borne in leaf axils, never at branch tips.

Fruit

Holly "berries" are technically globe-shaped or egg-shaped (ovate) drupes, usually made up of 4 segments, each containing one seed. Like the flowers from which they develop, they are always found in leaf axils. Today, hollies are available with white, cream, yellow, orange, red or black fruits.

Leaf

Holly leaves are always simple, never compound or lobed. They're arranged alternately (very rarely oppositely) on the stem. The leaves are leathery (coriaceous) or paperlike (chartaceous or membraneous) in texture.

WHAT'S IN A NAME?

In Denmark, holly is called "stikpalme"; in France, "le houx"; in Germany, "Christdorn" or "hultz"; in Holland, "schubbig hardkelk"; in Italy, "agrifolio"; in Spain, "acebo"; and in Wales, "celyn." But in all countries, botanists recognize the plant when it is called *Ilex*. That's just one reason why botanical names are so important.

Ilex is the name of the genus (a closely related group of plants) to which all hollies belong — well over 400 species worldwide. The species is the basic unit in plant classification. The botanical name of a plant consists of two words: the first is the genus (in this case *Ilex*), and the second is the name of the particular species (*Ilex opaca* or American holly, for example).

Further divisions below the rank of species are subspecies, varieties, forma and cultivars. Subspecies, varieties and forma occur in the wild. A cultivar is a plant specially selected or bred for horticultural use; it is usually reproduced by asexual, or vegetative, means. All holly cultivars are asexually reproduced from one parent plant and are genetically identical — which means they are clones as well as cultivars. At this level, classifications are made based upon one or more distinguishing characteristics within the species — for example, unusual leaf size or coloration. The name of the cultivar follows the name of the species in single quotes, as in *Ilex opaca* 'Canary', which is distinguished by its yellow fruit.



Longstalk holly
showing leaves
arranged alternately
on the branch and fruit in leaf axils

Leaf Outline

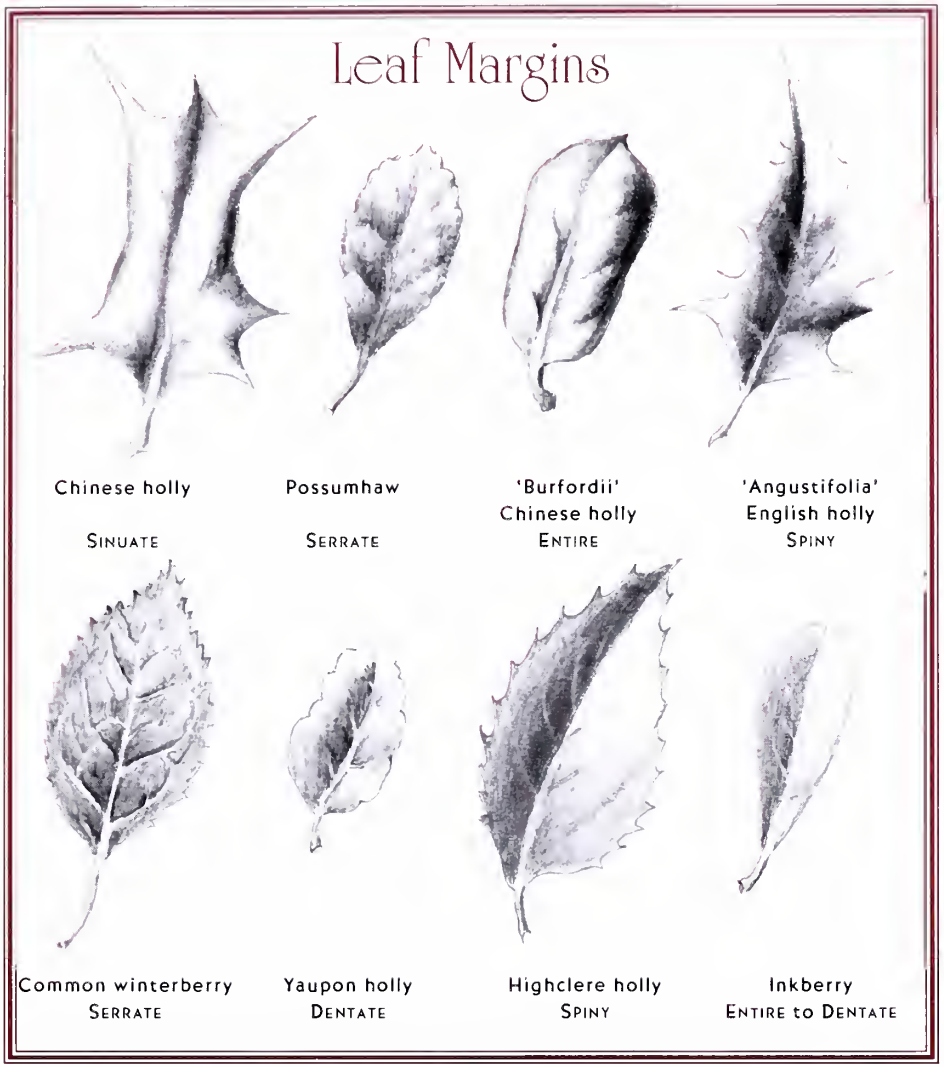
Holly leaves come in a variety of shapes, from quadrangular to lanceolate (lance-shaped; several times longer than broad and widest below the middle) to oblanceolate (broadest width above the middle) to oblong or ovate.

Leaf Margin

The character of the leaf margins or edges also ranges widely from entire (without toothing or division) to dentate (toothed) to serrate (saw-toothed, with the teeth pointing toward the leaf tip) to crenate (scalloped, with shallow, rounded teeth) to spiny or any combination of the above.

Leaf Tip

Some hollies have leaves that taper to a point concavely (acuminate) or convexly



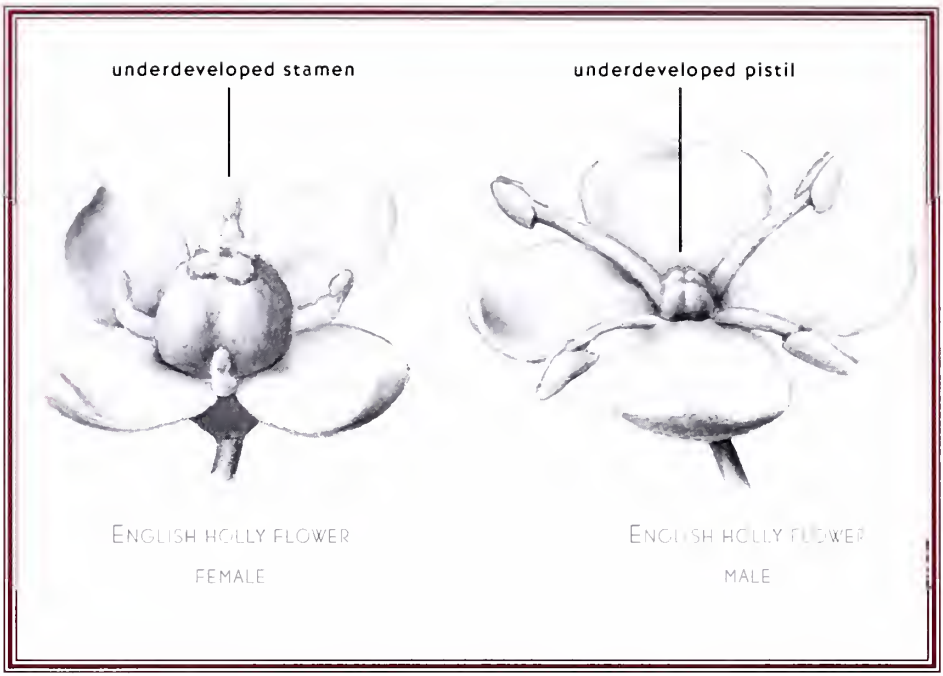
(acute). Others are abruptly pointed (apiculate), rounded and shallowly notched (retuse) or just plain rounded (obtuse). Some are spiny, some are not.

Leaf Base

The base of a holly leaf, where it attaches to the stalk, can be sharp (acute), blunt (obtuse), wedge-shaped (cuneate), rounded or nearly or quite straight (truncate).

Leaf Surface

The surface of a holly leaf, depending on the species, can be smooth (glabrous)



or hairy (hirsute) to varying degrees. Holly leaves run the gamut from dull to glossy.

The Sex Life of Hollies

Most people growing holly for the first time are surprised to learn that these plants generally are either male or female. Both sexes have flowers but only the females have berries. There must be a male plant with male flowers nearby to fertilize the female flowers if they are to produce viable fruit. (A few hollies, such as the English hollies, will bear fruit in the absence of a male plant. This process is called parthenocarpy. Parthenocarpic fruit has a tendency to drop before ripening. When it does persist and ripen, it is not viable and cannot germinate).

The pollen grains of holly are too heavy to become airborne. Pollination is usually accomplished by insects.

There are two ways to determine the sex of a holly plant. The first is to examine the flowers. Female flowers have underdeveloped stamens, lacking pollen; male flowers have underdeveloped pistils and do produce pollen. The second way is to observe whether or not a plant produces fruit. Fruit-producing plants are always female. Lack of fruit is not absolute proof of maleness, however, because unpollinated females also lack fruit.

Planting & Growing Hollies

BY ROBERT EMMERICH AND HERMAN C. GEHNRICH

Planting hollies is not much more difficult than planting other woody trees and shrubs. But there are a few rules you should follow to make sure your plant gets off to a good start.

Sun, Soil and Water

Selecting the right variety for your site is your first concern. Hollies are quite adaptable to the amount of sun available, but flowering, and therefore berrying, will generally be better on sites that receive some sun. Plants grown in shade will tend to be more open growing. American holly, *I. opaca,* is one species that will do quite well in light shade. Deciduous holly, however, shows a marked preference for sun, and berrying will be very sparse in shaded areas. Male plants, and even females that aren't expected to fruit heavily, can be grown very successfully as foliage plants in lightly shaded locations, and will provide excellent background and screening in the garden.

ROBERT EMMERICH, an *active member of the Holly Society of America and recipient of the Bronze Medal of the American Rhododendron Society, has grown hollies for more than forty years.*

HERMAN C. (BUD) GEHNRICH *is a member of the Board of Trustees of the Holly Society of America. He has received the Presidents Award of the HSA and the Bronze Medal of the ARS. Bud was largely responsible for the conception and realization of this handbook.*



When the roots of a container-grown plant are heavy and have circled the pot several times, cut vertically through the ball from one side to the other using a spade. Then pull the two halves apart, "butterflying" the root mass before planting.

Hollies are not particularly fussy about soils, but are partial to slightly acidic soils that are well drained and light in texture. A few hollies are quite tolerant of moisture: American holly will do well in very moist sites, providing it is not standing in water. Winterberry, *I. verticillata*, will usually be found in the wild growing in swamps (though usually in full sun); in the home garden it also succeeds in a well drained location, though it still needs sun if it is to fruit well.

The best times for planting are early spring and early fall — early spring, to get the plant established before the heat of summer, and early fall, so that the plant's roots become established before the onset of harsh winter weather.

No matter when you plant, watering is important throughout the first summer season. During hot weather, you'll need to water a recently planted holly, especially after a week when there has been less than an inch of rain.

Selecting the Plant

Inspect both burlapped and container-grown plants at the nursery to make sure there is no evidence of wilting or dried-out roots.

Examine the root system of container plants carefully to make certain that the plant has not become pot-bound. If it has, the roots will have circled around the inside of the pot and will be a solid, entangled mass. If the ball is planted as is, there is a good chance that the roots won't fan out into the soil and the plant will fail to develop properly. The ball must be disturbed and the roots cut to encourage them



to seek out the new soil. Where the roots are small, use a knife to cut the ball vertically in three or four places around the periphery, and then tease the roots out.

When the roots are heavy and have circled the pot several times, more drastic measures are in order. Using a spade, cut vertically through the ball from one side to the other. The cut should extend halfway up the ball from the bottom. Pull the two halves apart for planting, "butterflying" the root mass. Obviously, the best course of action is to buy plants that aren't so heavily root-bound.

Moving Established Plants

If you're planning to move an established holly, it's best to root prune it the season before moving. Insert a shovel or spade with a sharp, long blade into the ground all around the plant. A good rule of thumb is that the diameter of the root ball should be about as wide in feet as the diameter of the plant trunk is in inches. This root pruning should be done in late summer or very early fall. Remaining roots will send out fine new roots that will hold the soil and be able to take up moisture readily when the plant is moved. Because root growth continues until the ground gets quite cold, and starts again as soon as the ground begins to warm, the plant will be ready for moving by the following spring, although moving a year later would be all right as well.

If you plan to move an evergreen holly, the use of an antitranspirant is recommended. This product coats the leaves and reduces the amount of moisture lost to the atmosphere. The plant does not wilt as much after moving, and the coating gradually wears off. Sound irrigation practices should still be followed; the coating is not a substitute for watering.



If you're planning to move an established holly, root prune it the season before moving. Insert a sharp shovel or spade into the ground all around the plant.

In the past, it has been recommended that if you move a holly without root pruning it, you should top prune it to balance branch and leaf growth with the reduced root mass. However, some recent research suggests that root-promoting auxins (growth hormones) are produced in buds at the ends of the branches and that transplanting without pruning is advisable. Until this difference of opinion is settled, it seems prudent to keep pruning after moving to a minimum. In any case, using an antitranspirtant is most important when the plant has not been root pruned. Water thoroughly before digging and moving the plant, preferably the day before so that moisture can move into all parts of the plant before any roots are cut.

Digging the Hole

Recommendations on planting trees and bushes have changed in recent years. Gardeners used to be admonished to dig a hole slightly wider and twice as deep as the root ball of the plant. Today, we are advised to put more effort into digging a wide hole, and making it only as deep as the root ball itself. The rationale for the new thinking is that this will prevent the plant from settling too deeply into the hole.

The hole should be at least twice as wide as the root ball. If the soil is of reasonably good quality, simply removing it from the ground and then replacing it



Dig a hole twice as wide and only as deep as the root ball, to prevent the plant from settling too deeply into the hole. If you're planting a burlapped plant, remove the burlap from at least the upper half of the root ball.

as fill after the holly has been put in place will suffice.

If you dig the hole too deeply and must put soil back in to raise it, make certain that the soil is well packed to prevent settling. As an alternative, place a flat rock under the ball to raise it. Since holly roots branch out and do not send out a tap root, the rock will not inhibit the growth of the plant.

If you're planting a burlapped plant, remove the burlap and twine from at least the upper half of the root ball. This is best done after the plant has been set in the planting hole, prior to backfilling, to minimize possible damage to the roots.

Another old practice of excessively amending the soil with peat moss, leaf mold, compost, manure and other materials is also frowned upon these days because it discourages the plant's roots from spreading out into the less inviting surrounding soil.

If the soil is poor and heavy and simply not suitable for hollies, you must amend the soil, but don't go overboard, and make sure the hole is large enough to provide adequate space for the root system to expand and support the tree.

Today, amendments such as compost, leaf mold and bark are preferred to the old standby, peat moss. Peat is difficult to soak thoroughly, and once it dries

out, it will resist getting wet even when mixed in the soil. Also, peat is extracted from bogs. In addition, it is more expensive than many other suitable materials. In short, amend cautiously and select the right materials.

Don't fertilize at planting time; the tree should not be encouraged to send out new growth until it gets settled in.

Once it is planted, thoroughly water your holly and make sure that the fill is settled well into the hole — air spaces can be deadly to your new plant. Continue watering for several weeks, or more, depending on the weather.

IT TAKES TWO TO POLLINATE

If you have room for only one holly, select a female for the attractive berries. If no appropriate male hollies are nearby for pollination (within half a mile is usually close enough for bees to do the job), you'll need to purchase a male of the same species. If you don't have room, give it to a neighbor, who may wonder later why your plant has berries and his or hers doesn't.

Staking

Place stakes on opposite sides of tree-form hollies, being careful not to break through the root ball when you drive them into the ground. Don't tie the trunk too tightly to the stake; some motion should be possible. Tightly tied wire and even strong cord can girdle the trunk as the tree grows, cutting off the vital supply of water and nutrients to the top. Don't forget to remove the stakes and the tie when the tree has become established in a year or two, to prevent girdling. Also, remove any labels that might eventually girdle the plant.

Mulching

After planting, spread a two- to four-inch mulch over the root area, extending beyond the drip line of the plant. This conserves moisture in the soil and keeps the roots, which are near the surface of the soil, cool. Pine needles, leafmold, shredded bark and wood chips are all good natural mulches. Avoid black walnut chips, which contain a naturally occurring chemical that inhibits the growth of other plants.



A long-neglected holly may benefit from drastic pruning called "hat-racking." Cut back the holly until the top branches are short stubs. As you work downward, increase the length of the pruned branches to form a cone.

Don't rake up your leaves in autumn — they make a very satisfactory mulch, particularly if they're oaks. Maple leaves are less desirable as they tend to mat down and inhibit the exchange of air and moisture so important to the health of the tree. The idea is to approximate the conditions under which the plant grows in the wild, where there is a constant renewal of organic matter beneath the tree each year.

Pruning

Hollies will usually produce a well shaped specimen if given room to grow. Most of the spiny-leaved evergreen types tend to grow in a tall conical shape which can be maintained with a minimum of pruning. *I. opaca*, *aquifolium* and hybrids such as x *aquipernyi* will have a pleasing shape when young if they are pruned to a single leader and given an occasional judicious snip.

On the other hand, when some cultivars are ten or more years old, the neat habit disappears. Growth becomes more open and ragged, and new growth

occurs near the ends of strong branches that grow upward. It's time for pruning to restore the shape and encourage new growth to fill in around the tree. This growth will sprout from the pruned branches because hollies have an abundance of latent buds under their bark.

For long-neglected hollies, a drastic pruning process called "hat-racking" may be worth a try. Cut back the holly until the top branches are short stubs. As you work downward, increase the length of the pruned branches to form a cone. The tree will be rather unsightly but should fill out nicely in a few years, forming many new shoots from the ends of the shortened branches. These should be thinned to remove the ones growing toward the center or straight up or down.

Several types of holly can be pruned into hedges and other decorative shapes. *I. crenata*, *I. cornuta* 'Dwarf Burford' and some of the blue hollies, such as 'Blue Girl' and 'Blue Boy', make outstanding evergreen hedges. Holly hedges can be sheared several times during the growing season to maintain their appearance. Some vigorous shoots may have to be removed occasionally. If so, cut them well below the outline of the hedge to eliminate stubs at the surface.

Pruning is best done during the dormant period. If you prune just before the holiday season you will have sprigs for decorations and wreaths, and your friends and neighbors will be delighted to accept your extra trimmings.

Long-term Maintenance

The amount of fertilizer needed by hollies will vary with the type of soil in your area. Nutrients filter quickly through light, sandy soils, while heavier soils, or those with a high organic content, will retain the fertilizer longer. Use one pound of fertilizer per inch of trunk diameter in light soils, less in richer soils. An all-purpose fertilizer such as 10-6-4 is a good choice and more economical than a specialized brand intended for broad-leafed evergreens.

As your holly matures, fertilize less so that the new growth is not so vigorous that it hides the fruit. A fertilizer high in phosphorus and potash is preferable for the older tree. The best time to fertilize is around the middle of March in the Middle Atlantic area. Avoid late summer and fall feeding so as not to stimulate late growth which might be winter killed. Spread the fertilizer evenly both inside and outside of the dripline of the tree but well away from the trunk.

In areas where hollies grow naturally there is usually enough rainfall to sustain growth. Once the holly is established, water only during droughts. During dry periods, soak the root area thoroughly once a week. This is much more beneficial than frequent shallow waterings.

Landscaping with Hollies

BY ROBERT ADAMS

At historic Williamsburg, Virginia, a tour guide recently led a group of visitors through the formal gardens of the Governor's Palace. One appreciative tour member extolled the exquisite quality of the "fine boxwood hedge" found throughout Williamsburg. The tour guide blushed slightly and replied, "Actually, most of the hedge is yaupon holly. We find it does much better than boxwood."

ROBERT ADAMS *gardens near Indianapolis, Indiana. Bob is a trustee of the Holly Society and the Magnolia Society, and a member of the International Plant Propagators Society.*



A row of weeping yaupon hollies softens a brick wall.

In the last 20 years, many gardeners have found that the genus *Ilex* provides superior plants for landscaping.

In recent years, more and more gardeners have discovered native and oriental deciduous hollies, which, with their bright fruits hanging picturesquely from their naked branches, provide more vibrant color in the winter landscape than the evergreen types. What's more, the fierce winters of the late 1970s brought on a search for new, hardier evergreen hollies, such as the blue hollies (*Ilex* x *meserveae*).

No holly testifies to these changes more than the native yaupon holly and its increased popularity in USDA hardiness zones 7b to 9 where it is hardy. Thanks largely to the efforts of a few nurseries such as the Tom Dodd Nursery in Alabama (and despite its unfortunate botanical name, *Ilex vomitoria)*, several cultivars of this species are now available. There are dwarf, medium, tree form and weeping forms of yaupon holly. The berry color of this fine evergreen native ranges from red to yellow.

Designing with Hollies

Hollies are some of the most versatile of plants. Indeed, holly can satisfy the five basic garden design principles. First, holly can be used to suggest a path to lead you through the garden. Second, hollies can create an unsurpassed backdrop in the garden. The delicate colors of some magnolias, Chinese witch hazel, winter hazel and daphne are tastefully accented with an evergreen holly background. Third, hollies are an effective foil for other colors in the landscape. In their brilliant perennial borders, eminent British gardeners Gertrude Jekyll and William Robinson used strong elements such as a stone wall or an evergreen holly planting to stabilize the color scheme.

Hollies are also useful for creating a focal point in the garden and adding texture. No other plant genus succeeds so well in providing these elements in the landscape, from the tiny rock garden hollies to the majestic 80-foot hardy evergreen hollies, especially in the autumn and winter seasons. A fine example is the slope above the conservatory at Brookside Gardens in Wheaton, Maryland. Two great hollies dominate the crest of the hill with a deciduous forest in the background. One of the trees is the splendid American holly 'Dengle Belles' with orange and pinkish berries. The other holly is the lustrous *I.* x *attenuata* 'Sunny Foster' with leaves of varied golden hues on the sun-facing side of the tree.

Forms and Effects

Winter sun is hard on hollies that are tender in your area. Keep this in mind



A fruiting holly and a clematis-covered arbor announce the entrance to this garden.



ELLYN MEYERS

This elegant cone-shaped American holly makes an outstanding specimen plant.

when choosing hollies, because one of the main attractions of evergreen varieties is the beautiful sheen reflected by that winter sun from the foliage and berries. Variegated hollies show well in shadier positions; they also tend to be less hardy than their solid green counterparts.

Over 90 percent of the hollies selected for good variegation are English hollies or their hybrids. John Wieman of Portland, Oregon, has devoted over fifty years to developing these hollies of fascinating color and leaf form. 'Betty Brite', 'Bright Bush' and 'Crinkle Green Variegated' are all variegated and dwarf in habit. His exquisite 'Moonlight' English holly cultivars can be used in containers or in the border to literally light up the landscape.

Most evergreen hollies demonstrate amazing resistance to pollution and salt spray. Landscapers often use both English and American hollies as screens and sound barriers along busy highways, or in hostile urban situations.

Deciduous hollies, native primarily to the eastern half of the United States, do well in Zones 4 through 9. Selections of *I. verticillata* by Robert Simpson of Vincennes, Indiana, and cultivars of *I. decidua* introduced by Bon Hartline of

Anna, Illinois, have created an insatiable demand among landscapers. The cross of the oriental *I. serrata* with *I. verticillata* produced such outstanding plants as 'Harvest Red', 'Sparkleberry' and 'Bonfire'.

Deciduous hollies prefer soils slightly acidic to neutral. They are much easier to grow than evergreen hollies because they require less nitrogen fertilizer, mulch and protection.

Now that gardeners have become enraptured by the native winterberry, *I. verticillata*, they are ready for the new cultivars of another eastern native, possumhaw, *I. decidua*, only recently available in the trade. Finches and mockingbirds adore this species, so grow at least one near your house for wintertime entertainment.

Yellow-berried cultivars of deciduous hollies tend to show better than reds in winter, especially when backed by a solid evergreen planting. *I. decidua* 'Byer's Golden' and 'Goldfinch' are hardy at least to USDA zone 5. *I. verticillata* 'Winter Gold' is a yellow-berried sport of the popular red-berried 'Winter Red'.

A most significant discovery in possumhaw culture was recently made by Clarence Hubbuch, horticulturist at Bernheim Forest in Clermont, Kentucky. Hubbuch found that *I. decidua* plants can easily be trained to single-stem standards, thereby creating stunning berried small trees with the plants' handsome gray bark exposed. Only minimal pruning of a few suckers is required for the first three to four years. Sprout inhibitors containing napthaleneacetic acid (NAA) make the task even easier.

The attractive bark patterns of holly impart a rugged beauty to the garden similar to that of the bark of mature beech trees. The bark of most species is a light-gray color. *I. serrata* and *I. verticillata* have black bark which contrasts well with their crimson-red berries.

Limbing up (that is, pruning the bottom branches of) beautiful hollies to show off their bark is a heart-rending procedure for some, but the result often will enrich the character of a winter garden. Limbing up a specimen or grove of small trees was a favorite design technique of the eminent landscape architect Thomas Church.

Keep in mind that hollies often need a good pruning every two or three years to retain good compact form, without errant branches here and there.

Both northern and southern gardeners have rediscovered an insect-resistant, carefree, hardy evergreen holly — the native inkberry, *I. glabra*. The lawn irrigation systems that cause yews to languish from overwatering make *I. glabra* thrive. Surprisingly, it also survives better than most hollies in neglected dry sites. The dwarf forms, such as 'Shamrock', make excellent semiformal, low-maintenance hedges.

For a generation now, southern landscapes have been planted with the great hybrid of English and Chinese hollies, *I.* x 'Nellie R. Stevens'. Many nurserymen now simply call it "Nellie." Nellie's popularity is being challenged by the new hybrids of lusterleaf holly, *I. latifolia,* with their six-inch, deeply veined, glossy leaves. These *I. latifolia* hybrids have an appeal comparable only to *Magnolia grandiflora.*

An early latifolia hybrid, 'Emily Bruner', is a cross with Chinese holly. The deep green gloss of its leaves and its heavy berries give an oriental effect. *I.* x 'Mary Nell' is a complex hybrid with a lighter green, deeply veined leaf. Nurserymen cannot satisfy the demand for these fine plants.

For gardens with limited space, dwarf or slow-growing hollies can fit the bill. Among the most attractive are two American hollies, 'Vera', an upright form, and 'Maryland Dwarf', a true dwarf and low spreading mound.

Japanese holly, *I. crenata*, and hybrids include many dwarf forms. 'Rock Garden' and 'Piccolo' are tiny one-foot-tall Japanese hollies that grow extremely slowly.

Fertilize dwarf cultivars sparingly to preserve their compact habits.

Hollies offer such a myriad of forms and effects in the landscape, you may want to check out one of the computer programs that have become available in the last few years to help design your garden. The best of these programs can truly help you make the transition from plant collector to landscape gardener. If you have an IBM compatible model, try Green Thumb Software, PO Box 18422, Boulder, CO 80308-8442; or MINDSUN (Gardenviews 5.1), Dept. H, RD 2, Box 710, Andover, NJ 07821. If you use an Apple computer, contact Terrace Software, PO Box 271, Medford, MA 02155.



Common winterberry and other deciduous hollies are stars in the winter garden.

Tips on Propagating Hollies

BY HAROLD L. ELMORE

Many holly growers don't even try to propagate hollies because they consider the process too complex, mysterious or difficult. The purpose of this chapter is to allay such concerns by describing the relatively simple principles underlying holly propagation, and to encourage holly enthusiasts to give it a try. There's nothing quite like the thrill of seeing tiny roots develop on the first cutting taken from one of your own hollies.

There are several ways to propagate holly: sprouting of seeds, severing of stolons (a form of division), layering, grafting, tissue culture and rooting of stem cuttings.

Almost all commercial and amateur propagators use the stem cutting process, which is the focus of this chapter. If you wish to explore some of the other propagation techniques listed above, consult *The Reference Manual of Woody Plant Propagation* by Michael A. Dirr and Charles W. Heuser Jr. (1987: Varsity Press, Athens, Georgia) or *Plant Propagation Practices* by James S. Wells (1985: American Nurseryman Publishing Co., Chicago, Illinois).

In the briefest terms, rooting of stem cuttings involves clipping a shoot from a growing holly, removing most of the leaves, wounding the base of the

HAROLD L. ELMORE *is the owner of Holly Haven Hybrids, a mail-order nursery in Knoxville, Tennessee, with a five-acre stock block of more than 600 different hollies. Hal has served Holly Society of America as President and Board Member, as well as in other capacities.*



Taking a cutting of American holly from the current season's growth.

cutting, treating it with a root-promoting chemical and sticking the prepared cutting into a damp rooting medium in a warm, humid, well lighted environment.

Choosing Cuttings

Although almost any branch of a holly can be encouraged to develop roots, you'll have better success if you select ideal cuttings at the ideal time. Cuttings should be from new growth of the current season (first year wood). If the shoot can be bent nearly 180 degrees without breaking, it is too immature. If it breaks with a snap, it is just right. Such cuttings are called "greenwood cuttings" and are best for most evergreen and some deciduous hollies.

Most deciduous holly cuttings should be taken earlier, at the "softwood cutting" stage, and then again in the fall, at the "hardwood cutting" stage.

The larger the diameter of the shoot the better, provided the wood is in the right condition.

Resist the temptation to select horizontal shoots so convenient to your pruning shears. Search instead for terminal and other shoots growing vertically. These will make much nicer plants.

Shoots closest to the roots of the mother plant will root best. Healthy, well fertilized and well watered plants produce the best cuttings.

When to Cut

Although seasons vary and the condition of new shoots ultimately determines when cuttings should be taken, an approximate calendar is helpful.

In hardiness zone 7, Chinese holly cuttings are often ready in July, as are cuttings of many of its interspecific hybrids. Japanese holly wood is ready in August, while September is better for English holly. Late fall or early winter is best for American holly.

These and other rooting parameters are summarized in "Propagation Guidelines," page 36.

How to Cut

Ideally, cuttings should be taken in the morning, while tissues are turgid (filled with water). Pruning shears are the usual tool for severing cuttings, though experienced propagators sometimes use a sharp knife.

Cuttings usually are 4 to 6 inches long, although much smaller and much larger cuttings can be used. Immediately protect cuttings from drying. Try to take all cuttings at approximately the same length.

If preparing and sticking are to be delayed more than a few minutes, place the cuttings in an ice chest. Small numbers of cuttings can be preserved temporarily in a plastic bag containing a wet paper towel and placed in a refrigerator (not the freezer).



Cuttings generally should be 4 to 6 inches long.



Strip most of the leaves from each cutting, leaving 5 or so at the top.

Preparing the Cuttings

Strip most of the leaves from each cutting, leaving 3 to 5 leaves at the upper end. Very large leaves can be cut in half (cleanly) to conserve space.

Use a sharp knife to "wound" each cutting by making a cut through the bark but not deep enough to enter the

woody part of the stem. Start about one inch (less on short cuttings) above the base and slice downward to the base, removing a narrow sliver of bark. This is called a "heavy wound," and is best for most hollies.

Roots will develop along the margins of these wounds. Larger-diameter cuttings can be wounded on both sides, resulting in a more balanced root system.

"Light wounds," thin vertical cuts made with knife tip or razor blade without removing any bark, work well with Japanese holly.

Hormone Treatment

Certain natural compounds can initiate and enhance rooting of stem cuttings. Though properly termed "auxins," these compounds are widely called "hormones." Practically all propagators use either indolebutyric acid (IBA) or napthaleneacetic acid (NAA), or a combination of both.

Some propagators prefer to prepare dilutions of the pure chemicals, but most take advantage of commercial preparations, either liquid or dry powder.

Commercial products commonly used include:

Hormodin #2	0.3% IBA powder	Merck & Co.
Hormodin #3	0.8% IBA powder	Merck & Co.
Hormo Root 2	2.0% IBA powder	Hortus Products Co.
Dip-N-Grow	1.5% IBA + NAA liquid	Alpkem Corp.

Both powder and liquid formulations have their strong adherents and detractors. Both methods work well on holly cuttings.

The cuttings should be immersed in liquid formulations from one second to 24 hours (the longer the contact, the greater the impact of the hormone); a 5-second dip is the most common practice.

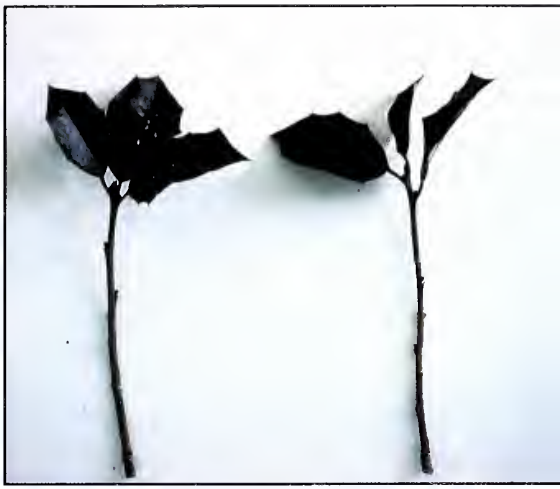
The key to successfully rooting hollies is to match the condition of the cutting wood with the correct hormone treatment. If the treatment is too strong, the treated part of the cutting will blacken and the cutting will die; if too weak, the cutting will develop few if any roots.

The table "Propagation Guidelines" provides tips on when to cut and how much hormone to use for various species. All treatment concentrations listed in the table are achievable using the four commercial products listed above.

When experimenting with a new kind of holly, take cuttings during the first month shown in the table and use the weakest of the hormones indicated.

If all cuttings quickly blacken, remove and discard them. Wait two weeks and take another batch of cuttings and treat with the same hormone at the weakest concentration listed in the table.

On the other hand, if there is no sign of root development or even callus formation (white tissue at wound edges and/or cutting bases) after one month, re-treat the cuttings at a stronger concentration, or take a new batch of cuttings and use a stronger treatment.



Too many leaves have been stripped off of these cuttings.



With a sharp knife, remove a sliver of bark at the base of the cutting.

Rooting Medium

Many different materials and mixtures have been used as the medium into which the holly cuttings are stuck. Coarse sand, peat-sand mixtures, perlite and peat-perlite mixtures are commonly used. My experience with many hollies is that a mixture of one part milled sphagnum peat moss to two parts horticultural perlite is close to ideal.

There is a trend toward "direct sticking" — that is, the use of the same medium for rooting, usually in a small pot, and for growing on.

Prepare a well drained bed with the selected medium or fill individual small containers. Water the medium and let it drain several times to ensure saturation. Punch small holes in the medium to a depth of about one inch using a pencil, nail or anything having a diameter slightly larger than the cuttings. Insert treat-

ed cuttings into the holes just deeply enough to cover the hormone-treated area, and gently firm the medium around each cutting.

At this point the cuttings are under great physical stress and their survival depends on several rather heroic measures. The situation can be likened to that in a hospital when a patient goes into cardiac arrest — a monitor sounds an alarm, a nurse shouts "Code Blue!" and doctors and nurses come running.

Since the cuttings have been severed from their roots, the major source of water and nutrition has been cut off. Respiration continues in the leaves,

A PROPAGATION CHAMBER FOR BEGINNERS

If you want to root a few holly cuttings but are intimidated by all the gadgetry, consider a simple and inexpensive alternative — a propagation chamber that might also be called a miniature greenhouse or a portable coldframe. The basic structure is a standard polystyrene ice chest at least 12 inches tall.

- Use a sharp pencil to poke drainage holes every 6 to 8 inches through the bottom of the chest.
- Cut a piece of plastic window screen mesh to fit inside on the bottom of the chest to prevent plugging of the drain holes.
- Place one inch of pea gravel on top of the screen, followed by one inch of coarse sand.
- Add 3 inches of damp peat-perlite rooting medium. Sprinkle several times to moisten thoroughly and allow to drain overnight.
- Stick cuttings as described earlier.
- Moisten the top edge of the ice chest and cover the entire top of the chest with very thin (about 1/2 mil) polyethylene, the type used by many dry-cleaners. This thin plastic allows essential exchange of carbon dioxide and oxygen while preventing the escape of water vapor.

but dehydration begins to inhibit cell function. The cuttings are minutes from death.

However, if leaves are kept coated with thin sheets of water, rehydration occurs. Also, cool temperatures will minimize respiration, stabilizing the cuttings' vital processes so that they can survive for several hours or even several days.

Then, if leaves are exposed to enough light, photosynthesis will replace the energy lost through respiration. Once these critical needs are met, cuttings can be tucked into a warm, well lighted bed of friendly medium where photosynthe-

- Place your completed propagation unit where air temperature averages 70 degrees F and where additional light, as much as practically possible, can be provided.
- Note: do not expose the unit to direct sunlight; this can cause inside temperature to shoot up in excess of 100 degrees F (38 degrees C) and cook the cuttings.
- Resist the temptation to examine cuttings during the first week.

  Whenever you open the unit, sprinkle the cuttings lightly before carefully reinstalling the polyethelene sheet. Otherwise, watering is not necessary.
- For your first trial, use Chinese or Japanese holly or the hybrid cultivars 'Mary Nell' and 'Nellie R. Stevens', all of which are relatively easy to root. If all goes well, you should see roots on at least half of your cuttings in a month.
- After cuttings are well rooted, lift gently and pot into individual pots under ample light.
- In summer, cuttings can go outside in nursery beds in partial shade for several years before taking their places in the landscape.
- Keep fall- and winter-rooted cuttings indoors until after frost danger the following spring.

PROPAGATION GUIDELINES

Ilex species	Rooting season[1]	Hormone concentration[2]
aquifolium	Sept. to Feb.	0.8%T to 2.0%T
cassine	Sept. to Feb.	0.8%T to 2.0%T
cornuta	July to March	0.3%T to 0.8%T
crenata	Aug. to Feb.	0.3%T to 0.8%T
decidua	June or Oct.	10%Q or 0.8%T
glabra	Sept. to March	0.3%T to 0.8%T
opaca	Oct. to March	0.8%T to 2.0%T
pedunculosa	Oct. to Feb.	0.8%T
pernyi	Sept. to Dec.	0.8%T
serrata	June or Oct.	10%Q or 0.8%T
verticillata	June or Oct.	10%Q or 0.8%T
x *altaclerensis*	Aug. to Oct.	0.8%T to 2.0%T
x *aquipernyi*	Aug.	0.8%T
x *attenuata*	Oct. to March	0.8%T to 2.0%T
x *koehneana*	Sept. to March	0.8%T to 0.8%Q
x *meserveae*	Aug. to March	0.3%T to 0.8%T

1 Schedule is for hardiness zone 7. Colder zones: later for spring/summer cuttings; earlier for fall/winter. Warmer zones: earlier for spring/summer cuttings; later for fall/winter.

2 First concentration shown applies to the earlier date; second to the later date. T equals indolebutyric acid (IBA) in talc, Q equals liquid 5 second quick dip (10% Dip-N-Grow v/v).

sis will replace energy lost through respiration, and cuttings have the opportunity to complete their recovery by replacing missing roots at their leisure.

Humidity

Virtually 100 percent relative humidity in the air surrounding the cuttings will assure complete rehydration. Most professional propagators use an intermittent mist system. Although misting systems are useful, they're relatively complex, fairly expensive and subject to mechanical failure. One less complex alternative is a cold frame, usually sunken into the ground. If kept tightly closed, humidity in excess of 90 percent can be attained in a cold frame. Cold frames have been used for centuries and are preferred by some propagators even today.

Bottom Heat

Little if any rooting takes place below 55 degrees F; 70 to 75 degrees F is ideal. This means that propagation may be undertaken in summer months without much attention to the temperature of the rooting medium.



The cuttings have been dipped in rooting powder.


Six weeks later, a healthy root ball has formed.

However, since many holly species root best during fall and winter, you'll have to arrange to warm the medium. Techniques include hot water carried through metal or plastic pipes, hot air directed up through the medium and various electrical heating systems using wire grids or mats. Consult Lloyd C. Hahn's "A Dirt Farmer's Method of Rooting Holly," *Holly Society Journal*, Vol. 4, No. 4, Autumn 1986 for a detailed description of a system useful for a small scale operation.

The ongoing respiration in the leaves of holly cuttings can be balanced out by photosynthesis if leaves are exposed to about 100 foot-candles of light. If more intense light can be provided, cuttings can develop into more vigorous plants. Of course, additional light often means more heat, which means more moisture must be applied to the leaves to maintain the high humidity necessary for rooting.

Special artificial grow lights are widely used in propagation. However, many propagators find that ordinary fluorescent lamps are quite adequate — and less expensive.

Remember that light intensity diminishes with the square of the distance from a source. Intensity at one foot away from a lamp is 4 times greater than at 2 feet, 9 times greater than at 3 feet, and 16 times greater than at 4 feet. In short, a light source is more efficient if close to the cuttings.

Preventing Diseases

The optimum conditions for rooting cuttings are also ideal for many plant disease organisms. It's important to keep work surfaces sterile. However, you can often avoid disease problems simply by mixing fresh peat-perlite rooting medium for each batch of cuttings, and discarding the old medium after one use (it is a good amendment for garden soil). Perlite is essentially sterile, and fresh peat moss is mildly fungicidal.

PROPAGATION EQUIPMENT AND SUPPLIES

Brighton By-Products Co.
P.O. Box 23
New Brighton, PA 15066
Catalog, $5

Florist Products
2242 North Palmer Dr.
Schaumburg, IL 60173
Free catalog

E.C. Geiger
P.O. Box 285, Rt. 63
Harleysville, PA 19438
Free catalog

Mellingers, Inc.
2310 West South Range Rd.
North Lima, OH 44452
Free catalog

What's Eating Your Hollies?

BY AL COOK

Compared to such pest-of-the-month plants such as willows, plums, cherries and honey locust, hollies are subject to comparatively few serious insect pests. The worst offenders vary by region and sometimes even within a particular locale.

For most of us in the Midwest, the primary offenders are leaf miners, which devastate the leaves of our American holly (*Ilex opaca*), and spider mites, which suck our once-green Japanese holly (*I. crenata*) to deathlike gray. Not many other crawlies bother hollies in the Midwest, except black vine weevil in landscapes lacking sufficient *Taxus* and *Euonymus* species to satiate them.

In the Northwest, relatives of the leaf miner pests of American holly do similar ugly work and ruin the glossy leaves of English holly *(I. aquifolium)*. Holly bud moths also bother English hollies in the Northwest, feeding and making webs on new growth. Lesser nuisances (unless they're in your own yard) include leaf rollers, scales, mites and aphids.

From the East Coast, we hear wailings about hollyberry midge, the wormy stages of which ruin the red fruits of American holly, rendering them forever green and noncontrasty with the foliage come yuletide. What good are green holly berries?

Only other holly fanatics can appreciate the enormity of such a calamity.

Holly folks in the East also suffer from leaf miners, and mites of various persuasions, and a half-dozen or so species of scale insects, nasty little sap suckers that build various protective coverings over themselves. (Lest we pass lightly or blithely past scale insects, let us ponder that some 70 percent of the insects that



JAMES R. BAKER

Southern red mites suck vital juices from holly leaves. Horticultural soaps and oils can keep mite populations in bounds.

regularly violate hollies are scale insect species.) In some areas of the East, a real gaggle of holly-hurting insects and such (in addition to midges, miners, mites and scales) are tallied: aphids, mealybugs, whiteflies, budmoth, miscellaneous beetles and weevils and even grasshoppers.

To complicate matters, the East is a complex region, geologically and climatologically. Thus one side of a hill may have one bug, the valley below may be plagued by another pest and the far side of the hill may be clean.

Reports from the South are similar to those of the East.

Pest Control, General

Good culture is a great preventive tactic. Everyone knows that healthy plants will ward off predators (everyone except a given predator, that is). Give hollies room to enjoy their own patches of air. Give them loamy soil, well aerated and well drained. Give generously of mulch and decently of fertilizer, and water deeply once a week or so during droughts.

Selection of resistant species and cultivars is another good ploy. A quick scan of the literature reveals that American and English hollies can be soup kitchens for a variety of insects and mites. Other evergreen species and hybrids



Berries infested by the hollyberry midge are smaller and don't turn uniformly red. Handpick and destroy infected fruits.

(especially blue hollies, *I. meserveae*) are usually slightly immune to six- and eight-legged predators. Check with local authorities for cultivars resistant to mite species common to your area.

Some cultivars of American holly seem less susceptible to hollyberry midge than others — notably 'Miss Helen' and 'Vera'. Some Japanese holly cultivars shamelessly entice mites, while others, such as *I. crenata*, are much more resistent to mites.

If robust health and/or the choice of a resistant species or cultivar fail to keep insects and other small creatures away, the next step is to indentify the predators. Check bookstores and libraries for relevant books. Botanic gardens and arboretums can help, as can your Cooperative Extension office.

Maybe the things you see crawling over your hollies are innocent, just passing by. Maybe they are good guys, looking for the real holly pests to devour.

When it is obvious that the things really are deleterious to holly, it's time to meditate for a while, seeking revelations as to the population density you can live with. Surely one splotchy leaf is not cause for kamikase tactics. Maybe mites will diminish after the rain that meteorologists are predicting. Or maybe you are compelled to do something to save your holly's looks or life. Then and only then,



Tea scale on a Chinese holly. Scale can be controlled with horticultural oils, especially when they are in their crawling stages.

go for the bombs. Some weapons, of course, are less dangerous than others.

Look for "environmentally friendly" methods:

Horticultural soaps and oils will get some insects, mites and other pests, and seldom harm children or pets. Regular sprays of just plain water, somewhat forceful but not to the point of dislodging plant parts, have chalked up impressive statistics in the bug game. These sprays must hit the undersides of leaves for good results.

Handpicking is truly a nontoxic technique. This method is too tedious for most insect problems but is useful for hollyberry midge.

As a last resort, consider legal pesticides and/or miticides. Determine which materials are legal and effective. Consult your Cooperative Extension agent for advice on the most up-to-date pesticides to use. Fellow holly maniacs may offer advice, but some may be ignoring the book when they recommend plutonium, say, for leaf rollers. It is best to be safe, sure and legal.

Use chemicals (including soaps and oils) according to manufacturers' and lawmakers' recommendations and restrictions. Also, use a modicum of common sense. Never spray into the wind. Wash up after each chemical warfare sortie. Never mix more than you can use at one time. Triple rinse empty pesticide containers and sprayers. Check local regulations for disposal of empty containers.



Leaf miners have left their mark on this holly. Call your Cooperative Extension agent for the latest recommendations.

Pests and Controls

Leaf Miners

Leaf miner insects begin as flies that punch holes in leaves of some holly species (mostly *I. opaca*, *I. aquifolium* and *I. vomitoria*) and lay eggs therein. Eggs hatch into clever little larvae that eat the innards out of holly leaves, leaving ugly brown irregular tunnels that turn brown. Adult flies, when flying around before laying eggs, can be hit with various legal contact insecticides.

After eggs are laid and hatched, larvae think they are safe between the upper and lower leaf skins, but a systemic pesticide (one that penetrates plant tissue) can fool them.

Mites

Mites and their ilk are somewhere between pinhead and pinpoint in size. They revel in hot, dry weather, proliferating prodigiously on the undersides of holly leaves, sucking vital juices. Infested leaves go off-color, whitening, graying or browning, and masses of delicate webbing develops. The so-called "false spider mites" look like true mites and cause similar damage but produce no webs.

Sprays of horticultural soaps and oils are effective. As an alternative,

you can try regular sprays of plain water as mentioned above.

Scale Insects

Scale insects in feeding stages are usually little convex things on stems and/or leaves. They range in size from about the width of a soft-pencil mark to fingernail size. Shapes are round or oval or blobby. Colors are varied. Some scale insects look like tiny eyes, or fried eggs. Some are hard, some rubbery, some squishy.

Not only do scale insects suck plant juices, causing damage to infested plant parts and even death, but some also excrete stuff politely termed "honey dew," which gives rise to sooty mold which does no harm to hollies but often worries the bejabbers of holly owners.

Armored scale insects (with hard coverings that more or less protect them from chemicals) can be reduced in numbers with horticultural oils. Other scale species may be controlled with oil or other legal pesticides, especially during the crawling stages when the little rascals are out from under their rooflike covers.

Hollyberry Midge

Of the big hitters among holly predators, hollyberry midge is the hardest to control. Adults fly around about the time that American hollies flower and lay eggs in the flower ovules. If you kill them at this time you'll probably also kill the bees that pollinate the flowers. Thus no pretty berries. And yet, after fruits begin to form, the midge maggots are safely inside. The infected fruits will be smaller than normal. Worst of all, they'll lack some or all of the dramatic color for which they're famous.

So far, handpicking and destroying affected fruits is the only way to go.

Black Vine Weevil

Black vine weevil is a reclusive sort of vandal. Grubs chew merrily on roots, out of sight in the soil. Adults creep out of the ground at night and chew characteristic semicircular notches in the margins of leaves. Recommended retaliation involves applying pesticides thoroughly to foliage during late spring and summer.

A Final Note

There's a reason why no specific insecticides, other than soap and oil, are mentioned above. There's a very good chance that a chemical pesticide legal today won't be legal tomorrow. Call your local Cooperative Extension agent for the latest recommendations.

An Introduction to Diseases of Holly

BY J.L. PETERSON

The *Index of Plant Diseases in the United States* lists an impressive 65 different genera of fungi on holly. Many of them include more than one species, increasing this number considerably. Holly may also be affected by bacteria, nematodes and viruses. Considering the number of organisms reported as parasitizing holly, it's a wonder that this plant manages to survive in nature at all!

Fortunately, most of these organisms are not aggressive on holly and holly diseases are generally not serious. This isn't to say that holly diseases are never a problem, as some diseases can be quite serious when the right environmental conditions are present.

Plant diseases and their causes are classified as abiotic or biotic. Abiotic diseases are usually the result of unfavorable environmental conditions. These are also known as nonpathogenic or noninfectious diseases. Such factors as winter injury, drought, excess moisture, unbalanced nutrition, genetic plant weaknesses and mechanical damage fall in this category.

Biotic diseases, which are also called pathogenic or infectious, are caused by living organisms. A large number of the organisms reported on holly are considered secondary or weakly pathogenic; in other words, they live on weakened or dead portions of the plant. Some of these organisms do not penetrate the plant directly, but rather enter following damage from

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more aggressive parasites or through the wounds of a mechanically injured plant.

Diagnosing Diseases

To diagnose a plant disease you must know the symptoms of the disease. Then you must look for signs of the cause of the disease and patterns of occurrence.

The following steps are helpful in diagnosing a disease:

1. Determine what part of the plant is actually affected. Damage on the southwest side may indicate winter injury. Death of or damage on older leaves only may indicate a pathogenic disease or damage from chemical pesticides. Dead branches scattered throughout a plant may indicate cankers. If the whole plant is discolored or dying, a root disease, nutritional disorder, drought or excess moisture may be involved.

2. Observe the pattern of disease occurrence, particularly in larger plantings. Is the problem associated with a particular terrain? Are some areas free from the disease? How do these areas differ?

3. Look for differences in susceptibility among holly varieties. Are some cultivars affected less than others?

4. Look for mechanical damage to trunk or roots. Such things as bark splitting or peeling, animal damage and recent excavations near the root zone may be important.

5. Look for signs of fungus, such as fruiting bodies, on the plant. Keep in mind that some fungus problems on hollies are caused by only part of the life cycle of the particular fungus. A fungus may spend another part of its life cycle on dead organic matter such as leaves, an alternate host plant of another species or even in association with an insect. Does the organism, if present, seem to be following the damage, or did it cause the problem in the first place? Note if insects or other parasites are present. Generally, insects are more damaging to holly than diseases.

6. If you don't find anything above ground that indicates the cause of the problem, examine the roots, specifically root coloring and areas of most active growth. Is the entire plant affected, or only the upper portion?

7. Determine if the problem is recent or has been there for some time, causing a steady decline. Does the problem become more serious at certain times of the year?

8. Note which cultural practices have been used, such as fertilization or use of an herbicide.

COMMON DISEASE SYMPTOMS

Leaf Spots. Tar spots, caused by the fungus *Phacidium*, are one of the more common leaf-spot diseases. Yellow spots appear on the leaves early in summer and generally turn reddish brown as the season progresses. By fall, small, tarlike spots appear in discolored areas. Avoiding plant crowding and pruning to improve air circulation in the lower branches will help.

Cankers and Die-back. Cankers are characterized by sunken, cracked areas on stems or limbs. The various species of fungi that generally cause them usually enter through wounds in the bark. Twig and branch die-back, usually associated with cankers, may also be caused by these fungi. Removal of the affected limbs by pruning well below the canker area will help control these diseases.

Gray Mold. During prolonged moist weather the fungus *Botrytis* can cause a blossom blight of holly. In severe cases, the fungus will spread to adjacent leaves and twigs, causing a die-back.

Wood Rot. Large, conspicuous fungi often appear on dead or dying holly branches. These are secondary fungi which rot wood previously killed by some other cause. Where possible, prune out the dead wood of the affected holly.

Sooty Mold. A superficial black sootlike covering on the upper surfaces of leaves is caused by *Fumago* and other species of fungi. The unsightly leaf covering can be easily rubbed off the leaf. The leaf is not directly damaged, as the fungi live on insect droppings or "honeydew" covering the leaf surface, although leaves may tend to yellow beneath the heavy sooty coverings.

Leaf-Drop and Browning. Holly leaves often turn yellow or brown and fall. This simply may be natural leaf drop, or it may be caused by severe drought or winter injury. If the drought occurs in summer, leaf-drop may be particularly noticeable the following spring. During cold windy winters, unprotected holly may lose leaves and branches fail to leaf out the following year. Select cultivars with proven hardiness in your area.

Once you've determined the cause, you can choose the proper control measures. There are two types of disease control: cultural and chemical. Cultural control involves changing the plant's environment so that it is more favorable for plant growth and less favorable for the disease.

Don't just reach for the pesticide. In general, prevention is the best control. Some infectious diseases can be prevented by using a resistant holly cultivar, or by changing the growing conditions of a susceptible holly. Prevention may also involve reducing the source of infection by pruning out dead plant parts, cleaning up infected leaves and twigs from the soil surface and wholesale removal of dead plants.

If the disease is caused by an environmental or abiotic factor, or if a biotic disease is of secondary nature following stress of the plant, generally it will do little good to apply a pesticide. And applying pesticides after the symptoms are noticeable may not be the time the organism is most vulnerable to the treatment.

If you must resort to the use of a chemical, be aware that government regulations change constantly. Your local Cooperative Extension Service is the best place to go for the most up-to-date pesticide recommendations.

Further Reading

For information on identifying specific holly diseases, consult:

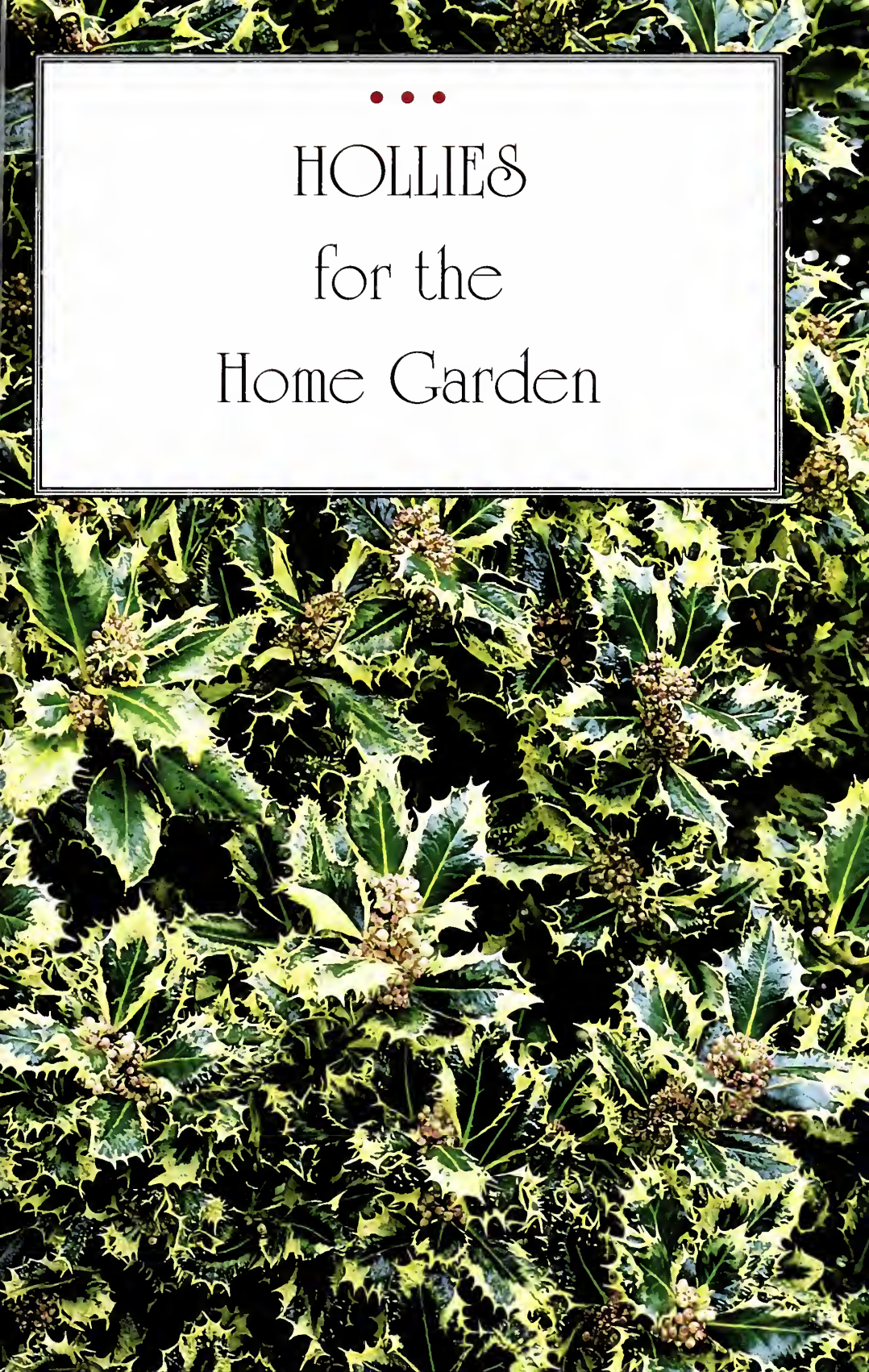
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Guba, E.F. and J.D. Stevenson, 1963. "Fungus and Nematode Inhabitants of Holly (*Ilex*)." *AES Bul. 530*, University of Massachusetts.

Pirone, P.P., 1978. *Diseases and Pests of Ornamental Plants 5th ed.* J. Wiley and Sons, New York.

U.S. Dept. of Agri. 1980 Agri. Handbook 165. *Index of Plant Diseases in the United States.* U.S. Govt. Printing Office.

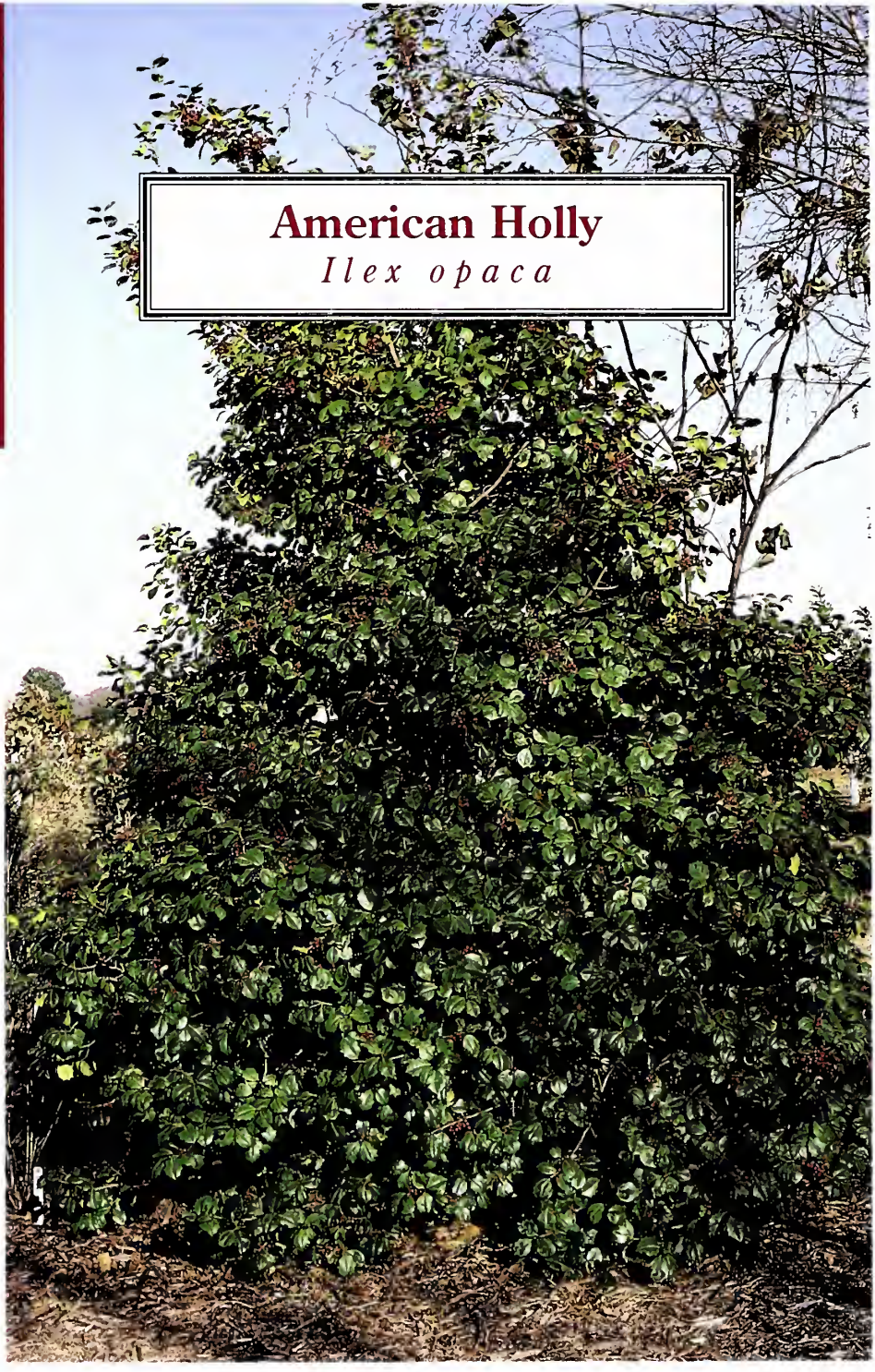
Reprinted and adapted from *Diseases of Holly in the United States, Bulletin No. 19*, Holly Society of America, 1982 (out of print). The balance of the 44-page booklet covers biotic and abiotic diseases in detail.



HOLLIES for the Home Garden

American Holly

Ilex opaca



Ilex opaca **'Satyr Hill'**

NATIVE HABITAT:

Eastern United States

HARDINESS ZONE:

5 to 9

OUTSTANDING FEATURES:

Hardiness is a cardinal attribute of this evergreen holly species, which can grow to 50 feet tall or more. Leaves are dark green, usually not glossy. Abundant small berrylike fruits (2/5 inch in diameter) come in all shades of red and orange; yellow on some cultivars.

HABIT AND USE:

Conical when young; open and rounded small tree when mature. Popular for specimens and tall hedges. An important source of midwinter food for birds.

HOW TO GROW:

Give this species loamy, well drained, slightly acidic soil, organic mulch beneath branches, nitrogen fertilizer every season and sunny or partly shady exposure. Avoid-windy locations. Regular selective pruning (not shearing) will maintain compact but natural looking form. Leafminer, holly berry midge and scale can be a problem, depending on the region.

VARIETIES AND RELATED SPECIES:

Many cultivars. Some of the better ones are:

'Canary' — A good yellow-fruited selection.

'Farage' — A fine conical shape with superior red fruits, popular from Indiana to Long Island.

'Hedgeholly' — Not restricted to hedges as name implies. A dense compact grower, usually as broad at base as it is tall. Good red fruit display.

'Jersey Knight' — An excellent male for pollinating.

'Jersey Princess' — Hardier than some. Leaves glossier than most. Vivid red fruits.

'Lacquerberry' — Very large glossy red fruits.

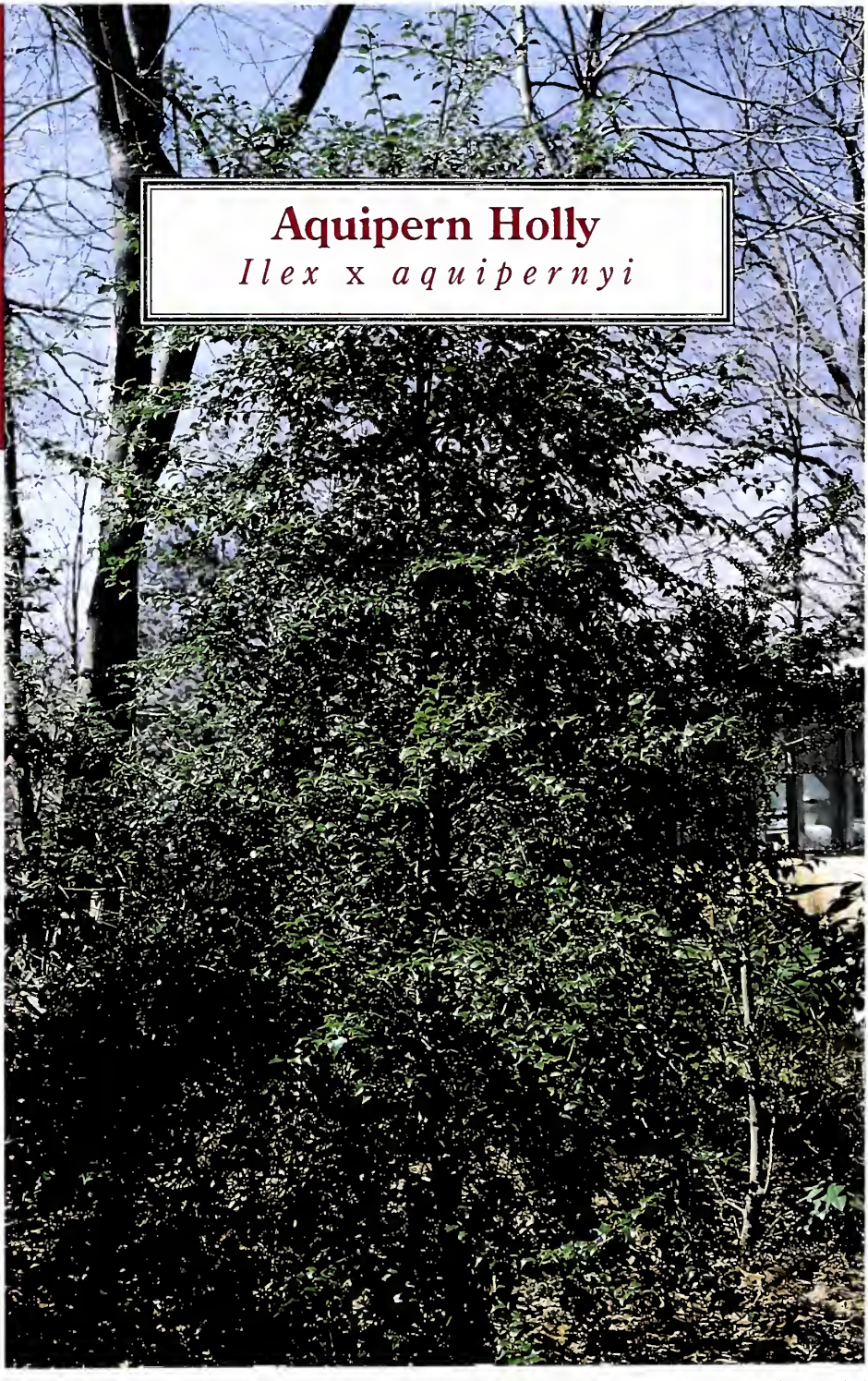
'Miss Helen' — One of the most adaptable and dependable red-fruited clones, performs well in Midwest, East and upper South.

'Old Heavy Berry' — An old favorite, sturdy in appearance. Large, dark lustrous leaves and red fruits.

'Villanova' — Large golden-yellow fruits.

Aquipern Holly

Ilex x *aquipernyi*



Ilex x *aquipernyi* **'Gable's Male'**

NATIVE HABITAT:

Hybrid

HARDINESS ZONE:

6b to 9

PARENTAGE:

aquifolium x *pernyi*

OUTSTANDING FEATURES:

Small, spiny evergreen leaves; fruits are dark red, rarely yellow.

HABIT AND USE:

Large shrubs or small cone-shaped trees excellent for specimens, corners of large buildings, screens and hedges

HOW TO GROW:

Same as English Holly.

VARIETIES AND RELATED SPECIES:

'San Jose' — A favorite in the Southwest. 20 foot conical shape covered with large dark red fruit. (Don't confuse with an *I.* x *koehneana* cultivar also called 'San Jose'.

'Rock Garden' — A tiny evergreen plant only a foot to 18 inches high and twice as wide. Excellent in small gardens or as bonsai.

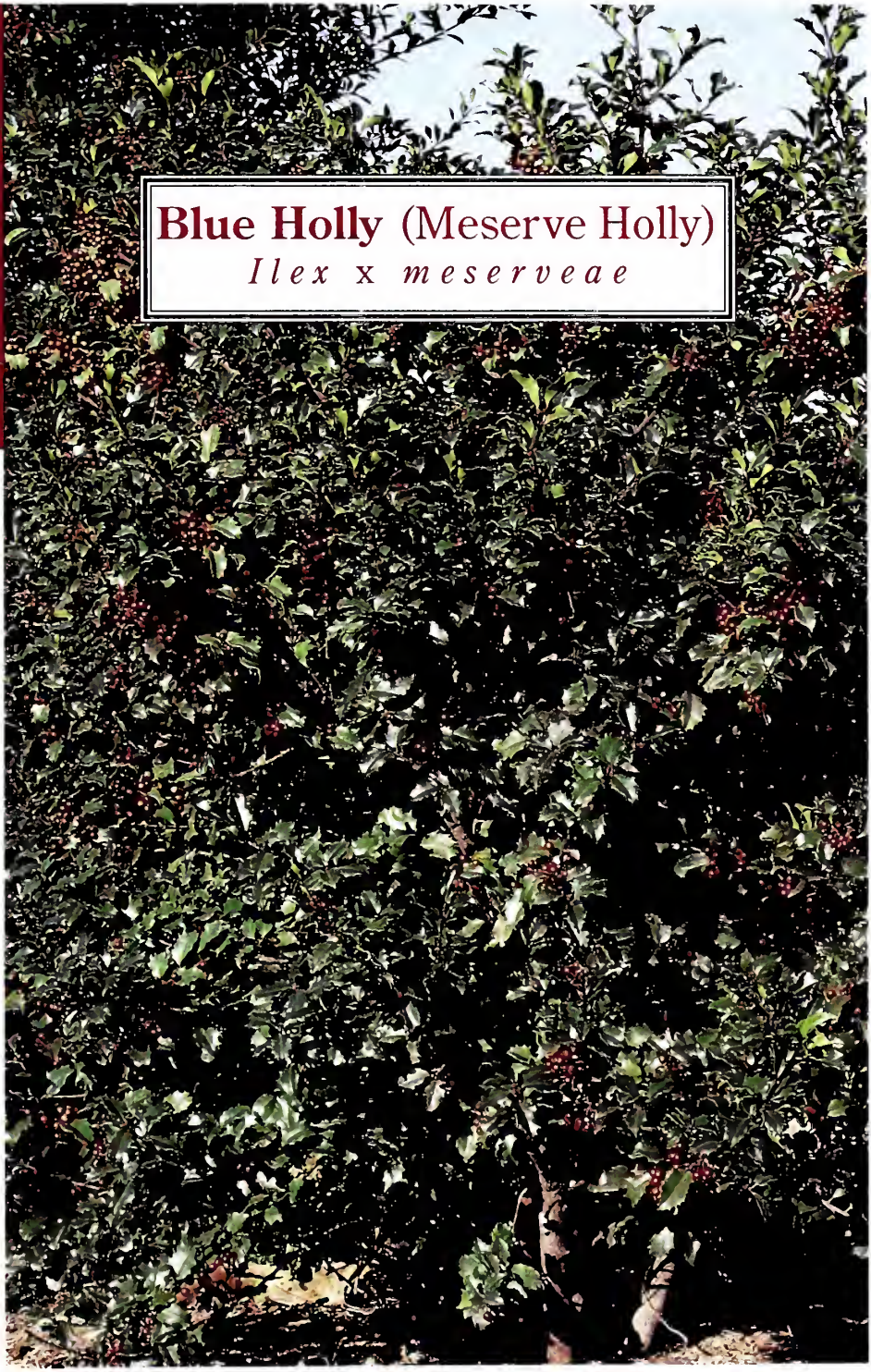
'September Gem' — A large evergreen shrub with an early display of bright red fruits persisting into winter.



Ilex 'September Gem'

Blue Holly (Meserve Holly)

Ilex x *meserveae*



Ilex x *meserveae* **'Blue Princess'**

NATIVE HABITAT:

Hybrid

HARDINESS ZONE:

5b to 9a

PARENTAGE:

rugosa x *aquifolium*

OUTSTANDING FEATURES:

Medium-sized, bushy cold-hardy selections. Bluish purple stems and lustrous blue-green, spiny, evergreen foliage, somewhat finer in texture than most Chinese and American types, usually with shining red fruits. The blue hollies are famous for eye appeal and history: an amateur gardener, Mrs. F. Leighton (Kathleen) Meserve, made the pollen transfer that originated this family of marvelous holly cultivars.

HABIT AND USE:

Mostly rounded and compact, blue hollies are used in foundation plantings, hedges (sheared or lightly trimmed or seldom touched), and mass plantings. In Zones 5 and 6a, most cultivars will not attain the sizes typical in milder areas. For example, 'Blue Princess' readily grows to 8 feet or more in Zone 7; specimens taller than 5 feet tall are unusual in Zone 5b.

HOW TO GROW:

In northern limits of hardiness, it is wise to use organic mulch, provide protection from winter wind, irrigate during dry times and apply fertilizer annually. These hollies respond well to careful pruning for neatness, but shearing imparts unnatural stiffness. In warmer zones, partial shade during summer afternoons is helpful, as well as mulch.

VARIETIES AND RELATED SPECIES:

'Blue Princess' — A dependable heavy-fruiting cultivar with glossy spiny leaves and rounded compact form.

'Blue Prince' — A popular male cultivar for pollen. Taller and a tad hardier than 'Blue Princess', this selection is a valuable landscape plant even though it is fruitless.

'Blue Maid' — A good fruiting female and a faster grower than 'Blue Princess' (some say it is also hardier but others disagree).

'Blue Angel' — A female with purple stems and good red fruits, this is the slowest growing blue holly cultivar but unfortunately is the least hardy (grows fine in Zone 7).

'Blue Stallion' — A vigorous robust male with dark green foliage without sharp spines. An excellent pollinator because of long blooming season. A great foliage plant for evergreen screening.

'Golden Girl' — A yellow-fruited cultivar.

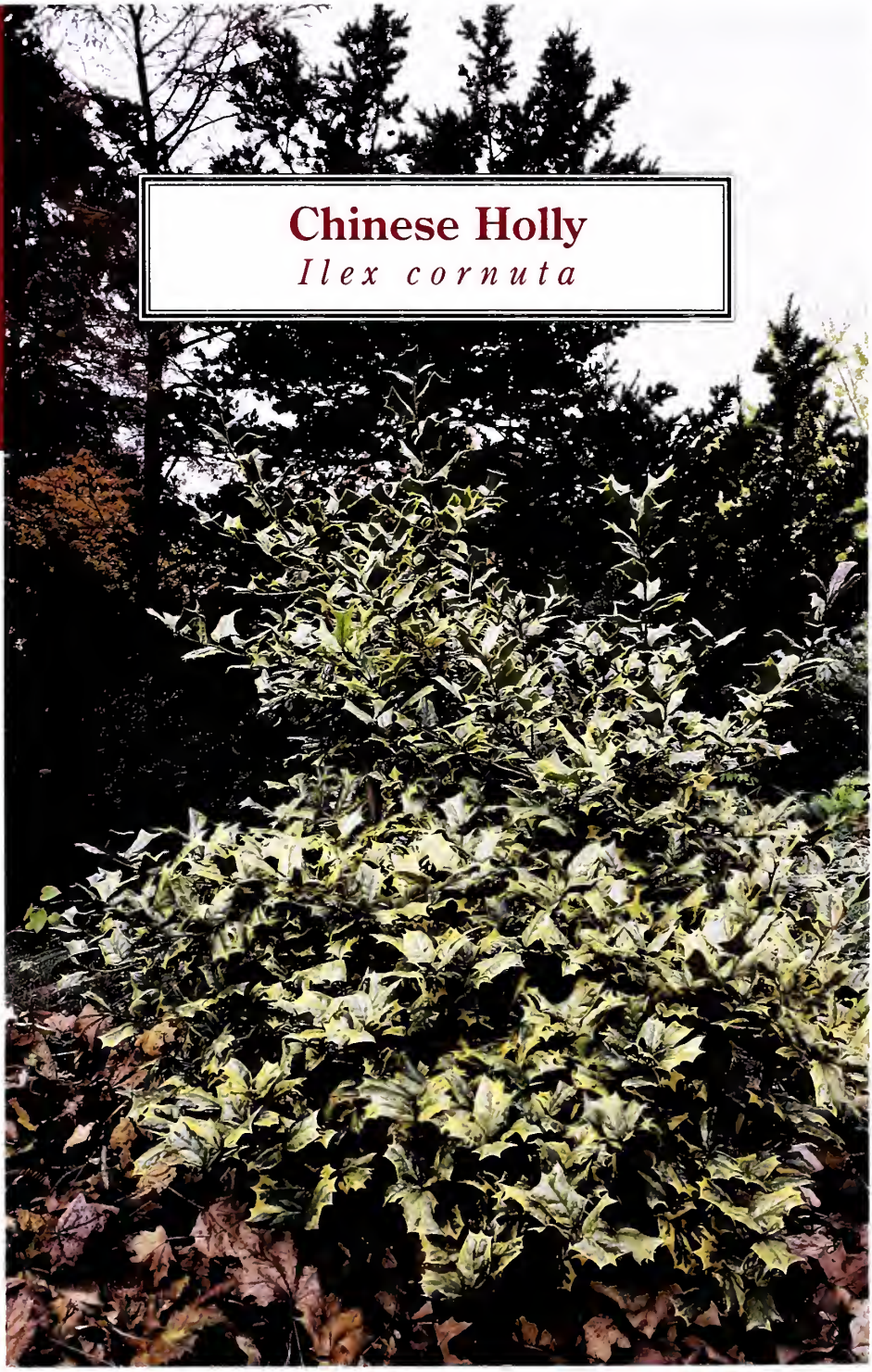
Sometimes erroneously called blue hollies, but actually from different parentage (*cornuta* x *rugosa*), are two excellent cultivars. They are hardier than the blues and more tolerant of hot weather, but their foliage is lighter green and not as glossy. Untrimmed, they mature at about 10 feet tall and equally wide.

'China Girl' — Plenty of large, 1/3-inch red fruits on a compact shrub.

'China Boy' — Male companion to ensure fruiting of the female above.

Chinese Holly

Ilex cornuta



Ilex cornuta **'O' Spring'**

NATIVE HABITAT:	HARDINESS ZONE:
Eastern China and Korea	**7 to 9**

OUTSTANDING FEATURES:

Large, dark, shiny green leaves, sometimes to 4 inches long, often strongly rectangular, usually with sharp spines. Prolific red fruits (1/4 to 1/2 inch across) set without pollination (a male plant is not needed) and hang on till spring.

HABIT AND USE:

Compact growth. Various cultivars are useful for foundation and corner planting, screens and impenetrable hedges.

HOW TO GROW:

Chinese hollies are adaptable to slightly alkaline as well as acidic soils, and they are quite drought tolerant. They fruit most heavily in full sun. See English Holly. Watch for scale insects.

VARIETIES AND RELATED SPECIES:

The species is widely used in zones 7 and 8; popular cultivars include:

'Berries Jubilee' — Abundant, very large red fruits are set off by large spiny foliage. Compact growth to 6 to 8 feet in time.

'Burfordii' — A popular cultivar, will become a massive shrub or small tree, often too large for small gardens. Abundant large red fruit.

'Dwarf Burford' — Sometimes incorrectly called 'Burfordii Nana', similar to 'Burfordii' except that it is slower-growing by about half and has smaller leaves and fruits.

'O' Spring' — Handsome leaves variegated with light green, yellow and cream in irregular patterns. Male.

'Rotunda' — Another "people-stopper" with very spiny leaves. Compact growth, 6 feet tall in time. Red fruits on older plants.

Some notable hybrid cultivars:

'Emily Bruner' — (*cornuta* 'Burfordii' x *latifolia*). Zone 6b to 9. A large, 20-foot evergreen shrub with large leaves (to 4 inches long) and good red fruit.

'James Swan' — (*cornuta* 'Burfordii' x *latifolia*). Zone 6b to 9. A handsome male pollinator for 'Emily Bruner'.

'Doctor Kassab' — (*cornuta* x *pernyi*). Zone 6b to 9. A compact, narrowly conical to columnar form to 20 feet tall. Glossy evergreen foliage, excellent red fruits.

'Lydia Morris' — (*cornuta* x *pernyi*). Zone 6b to 9. Densely conical, large shrub with handsome spiny foliage and red fruits. About 12 feet tall and wide at maturity.

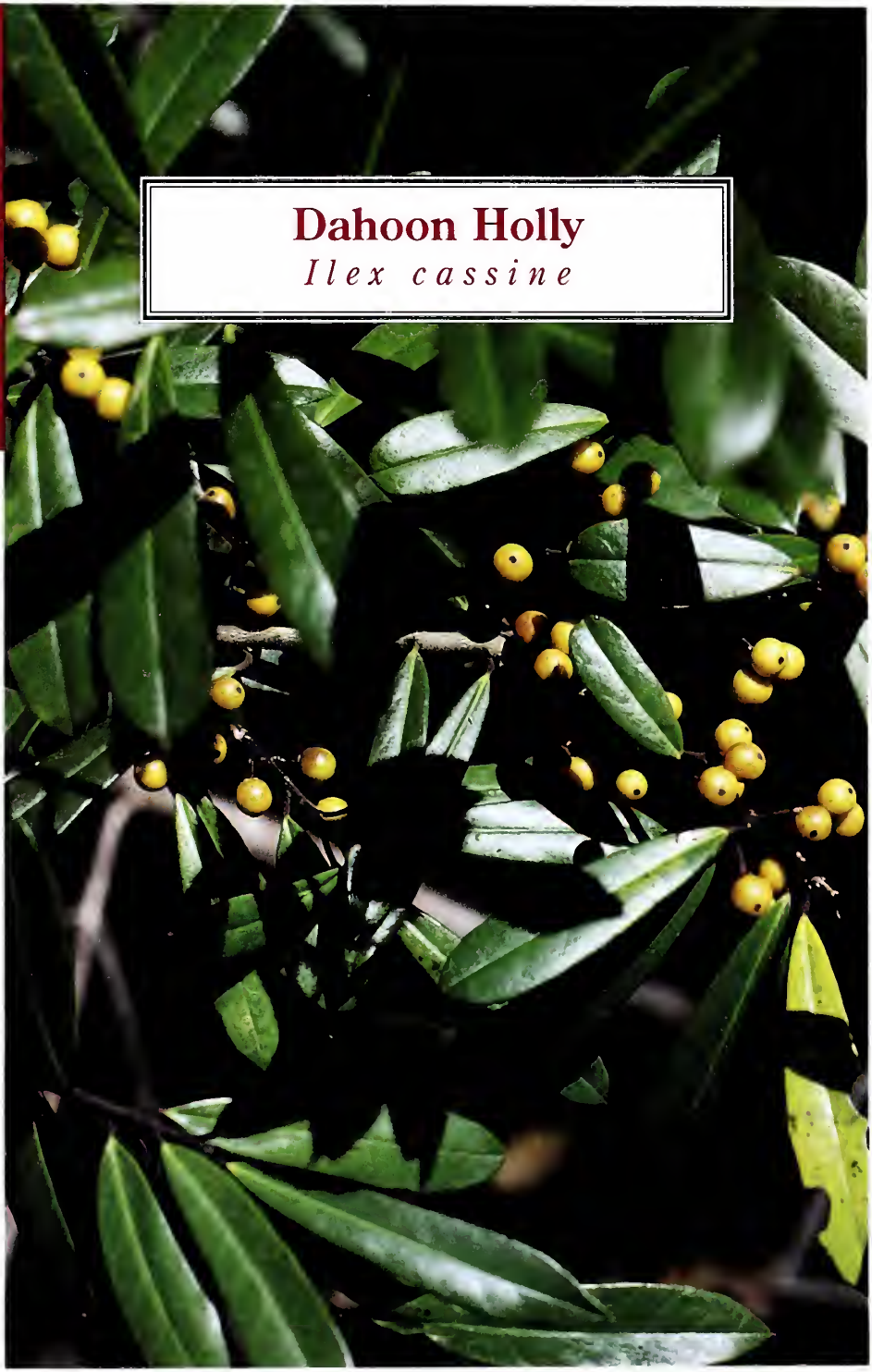
'John T. Morris' — The pollinating male selection for 'Lydia Morris' and others.

'Mary Nell' — ([*cornuta* x *pernyi* 'Red Delight'] x *latifolia*). Zone 7 to 9, extremely glossy, broadly lanceolate evergreen leaves. Rich red fruits. A superior holly.

'Nellie R. Stevens' — (*cornuta* x *aquifolium*). Zone 6b to 9. A highly popular evergreen in the South. Conical shape to 20 feet tall. Lustrous leaves with few spines. Good Chinese-red fruit. A real winner.

Dahoon Holly

Ilex cassine



Yellow-berried cultivar

NATIVE HABITAT:

Southeastern United States

HARDINESS ZONE:

8 to 9a

OUTSTANDING FEATURES:

A fine small evergreen tree, 20 to 25 feet tall. Produces a profusion of small brightly colored fruits (usually red) that persist.

HABIT AND USE:

This semirounded densely branched small tree is useful as an accent plant or patio tree and in group plantings.

HOW TO GROW:

A tolerant species, adaptable to most soils, including wet acidic conditions. Mulch, prune occasionally and fertilize annually.

VARIETIES AND RELATED SPECIES:

'Baldwin' — Red fruits, upright conical habit.

'Lowei' — Yellow fruits.

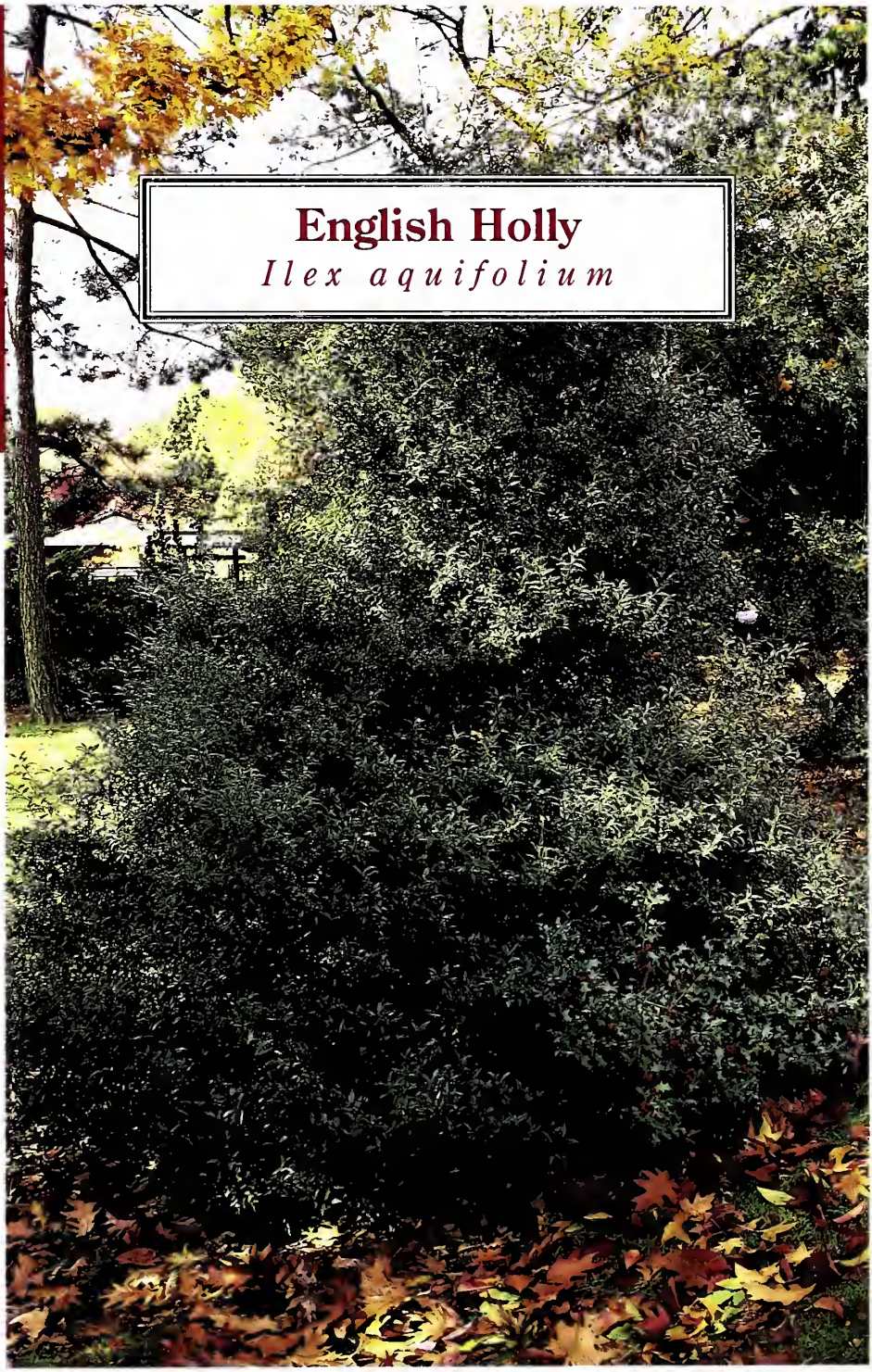
var. *myrtifolia* — Tiny, narrow, willow-like leaves.



PAMELA HARPER

English Holly

Ilex aquifolium



CHRISTINE DOUGLAS

Ilex aquifolium **'Angustifolium'**

NATIVE HABITAT:

England, Europe, western Asia, northern Africa

HARDINESS ZONE:

6 to 8b

OUTSTANDING FEATURES:

Evergreen foliage is superb, featuring richly glossy leathery leaves, typically wavy edged, with sharp spines on leaf margins and tips. Leaves of some selections are variegated with silvery white or bright yellow. Small white fragrant flowers and subsequent bright red (yellow on some cultivars) 1/4-inch or larger fruits are borne on previous year's growth. Mature size varies from 20 to 40 feet tall, from wide to narrow.

HABIT AND USE:

Typical form is broadly conical when young, becoming round-topped at maturity, with dense foliage usually to the ground. Useful for screens, hedges and specimens, and cut sprays of berries and foliage are prized for holiday decorating.

HOW TO GROW:

Grows best in rich, well drained soil and a humid moderately cold climate (such as the Pacific Northwest and the Atlantic Coast from Massachusetts to Chesapeake Bay). Full sun is needed for maximum berry production, but afternoon shade and ample water is necessary in hot dry climates. This species responds well to pruning, even shearing. Annual fertilization, especially nitrogen, helps ensure good glossy foliage. Also benefits from a 3-inch layer of organic mulch such as wood chips or shredded bark.

VARIETIES AND RELATED SPECIES:

There are endless variations in foliage size and color, fruit color and growth habit, but those available in the nursery trade are limited.

'Angustifolia' — Available as either male and female, slow growing with small, narrow leaves. A good choice for limited space.

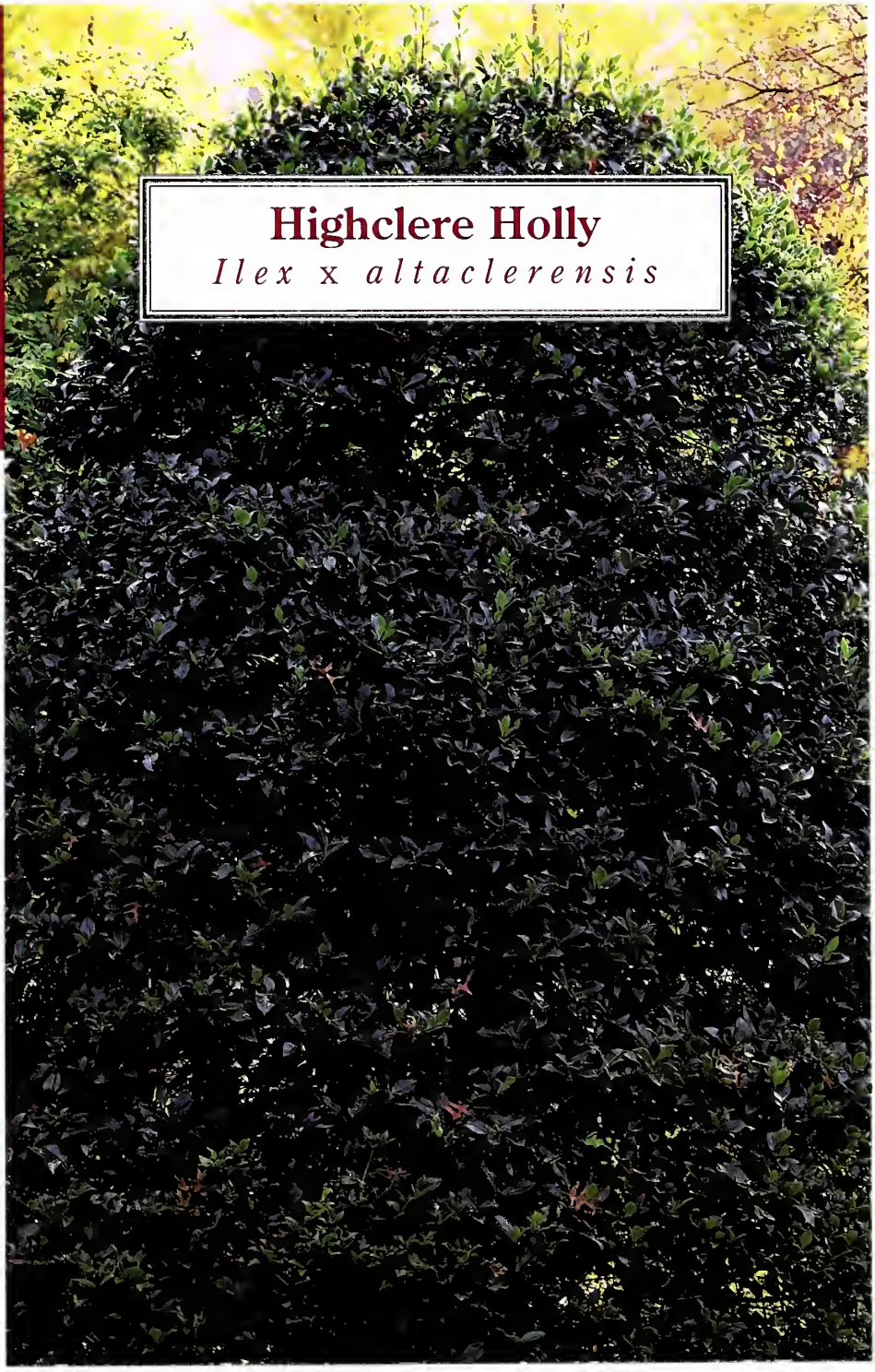
'Balkans' — Somewhat more cold hardy than most English hollies. Available in either sex.

'Sparkler' — Bears large clusters of red fruits at an early age.

'Argentea-marginata' — This is not a single cultivar, but rather a group of female types with silver-edged leaves, including 'Silvery', 'Silver Queen' and 'Silver Edge'.

Highclere Holly

Ilex x *altaclerensis*



Ilex x *altaclerensis* **'Camelliaefolia'**

NATIVE HABITAT:

Hybrid

HARDINESS ZONE:

7 to 9, 6b in protected spots

PARENTAGE:

aquifolium x *perado*

OUTSTANDING FEATURES:

Handsome evergreen leaves, often large and sometimes spineless. Red fruits. Often confused with English holly.

HABIT AND USE:

Vigorous large shrubs or small trees, good specimen plants, useful for screen plantings.

HOW TO GROW:

Easy to grow where cold hardy, somewhat tolerant of air pollution and salt spray. Organic mulch over root zone and annual fertilization are advisable. Prune as needed to keep appearance tidy.

VARIETIES AND RELATED SPECIES:

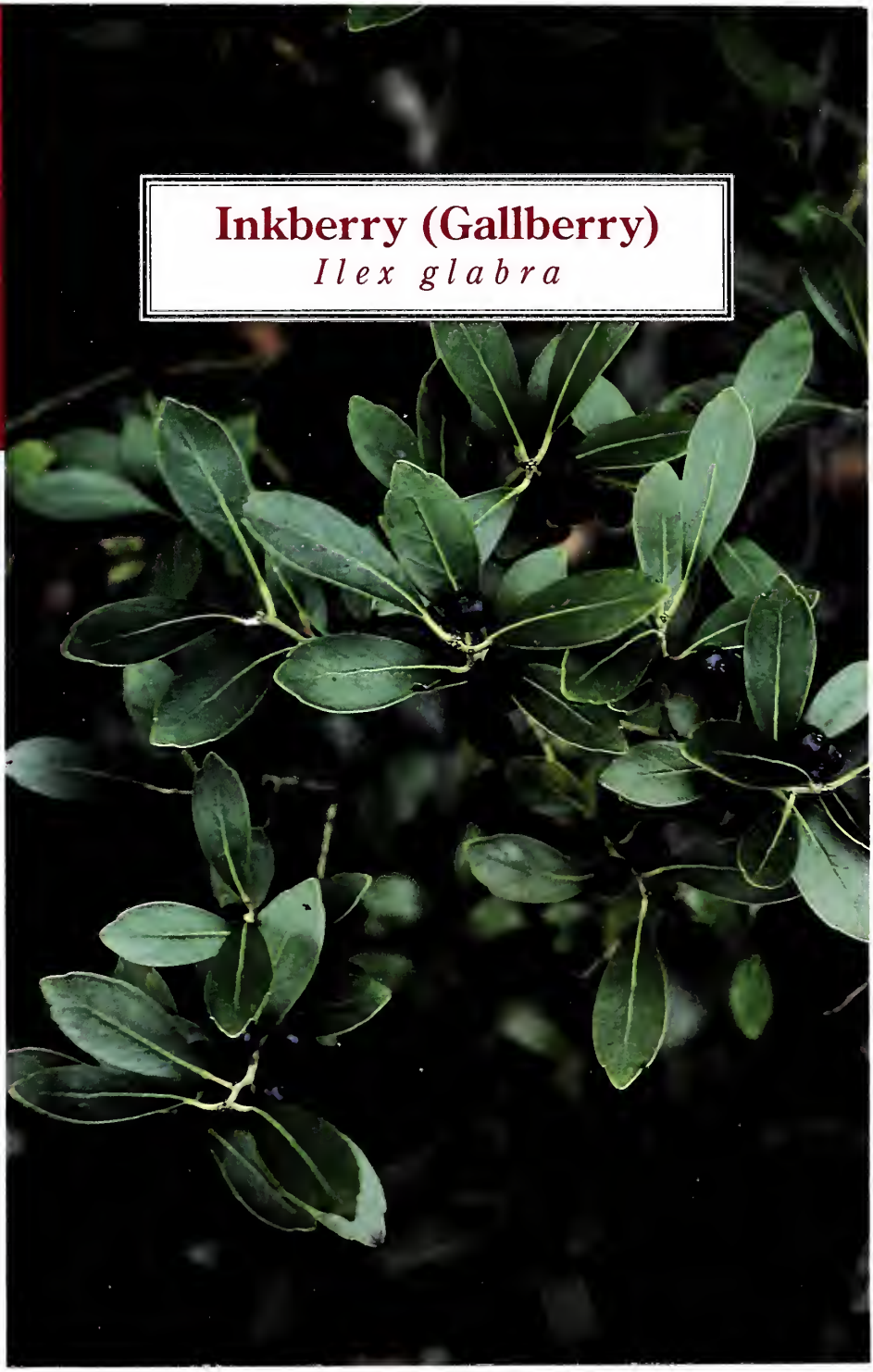
'Camelliaefolia' — Large lustrous leaves 5 inches long. New shoots are purple, abundant fruits are dark red.
'James G. Esson' — A vigorous female, deep green, with profuse red fruits.
'T. H. Everett' — A reliable male for pollinating.
'Wilsonii' — An old favorite female with vigorous compact conical habit and prolific vivid red fruits.



JULIE YN MEYER

Inkberry (Gallberry)

Ilex glabra



NATIVE HABITAT:

Nova Scotia to Florida and west to Texas

HARDINESS ZONE:

5 to 9

OUTSTANDING FEATURES:

Forms an evergreen, nonspiny, stoloniferous shrubby clump, maturing at 8 to 10 feet tall and wider (some cultivars are smaller). Female plants have inconspicuous black fruits.

HABIT AND USE:

The true species plants are useful for masses, naturalistic plantings and hedges. Slower cultivars are often used for foundation plantings.

HOW TO GROW:

Grows well in most ordinary soil conditions except very dry. Tolerates salt spray. Responds well to shearing. Practically pest free. Mulching and fertilizing will pay off.

VARIETIES AND RELATED SPECIES:

'Ivory Queen' — Off-white fruits on a 10-foot-tall bush.

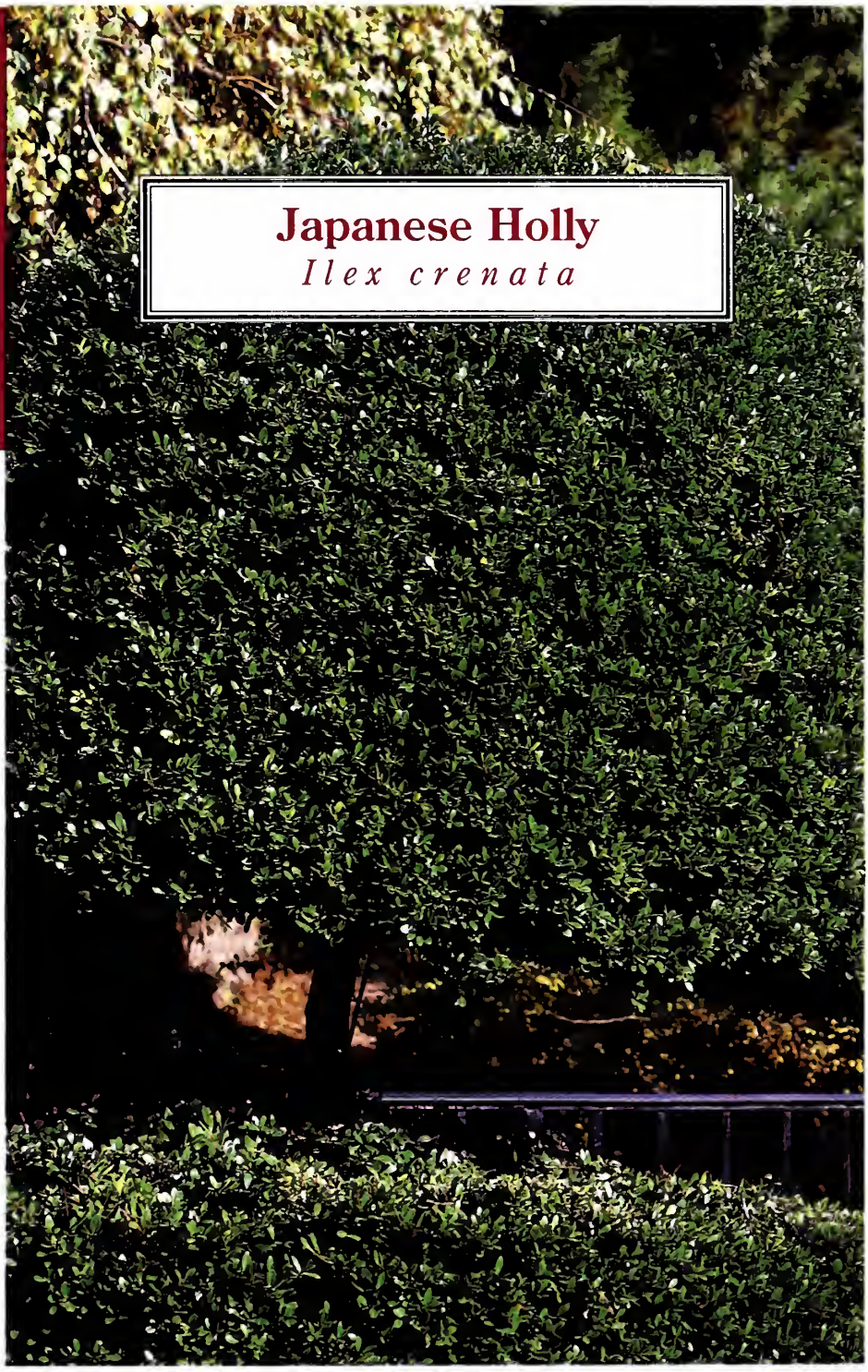
'Compacta' — Also known as 'Princeton Compact'. A fine slower-growing plant, 5 to 6 or more feet tall and wide.

'Chamzin' — Excellent dark green foliage. Slower growing. One of the hardiest selections. May reach 6 feet in height if unpruned.



Japanese Holly

Ilex crenata



NATIVE HABITAT:

Japan

HARDINESS ZONE:

6 to 9

OUTSTANDING FEATURES:

Lustrous, fine-textured evergreen foliage (not spiny) and a multitude of small- to medium-sized shrubby cultivars make Japanese holly popular for landscaping. Small black fruits (on females) are not showy. Collectors may want one of the several cultivars with yellow (really off-white) fruits.

HABIT AND USE:

Rounded, spreading and upright forms are available for use as hedges, foundation plants, topiary and container plants, including bonsai. Marvelously adapted to shearing.

HOW TO GROW:

Adaptable to various soil types. Organic mulch is recommended, especially in Zone 6. Thrives in both sunny and partially shaded situations. Best if shielded from wind in Zone 6, and from afternoon sun in Zones 8 and 9. Use nitrogen fertilizer annually. Spider mites can be a problem, especially in dry weather; daily forceful spraying with plain water is effective.

VARIETIES AND RELATED SPECIES:

Many cultivars exist. A few are:

'Beehive' — A dwarf dense mound, 2-3 feet tall. Male.

'Compacta' — Dark green mound, 5-6 feet. Male.

'Convexa' — An old cultivar, small convex leaves on a compact mound, among the cold hardiest of this group. Often used as a substitute for boxwood. Six feet or taller in time. Female.

'Dwarf Pagoda' — A true dwarf (grows about 2 inches per year). Upright, tiny leaves. Suitable for small gardens and for bonsai. Hardy to Zone 7a. Female.

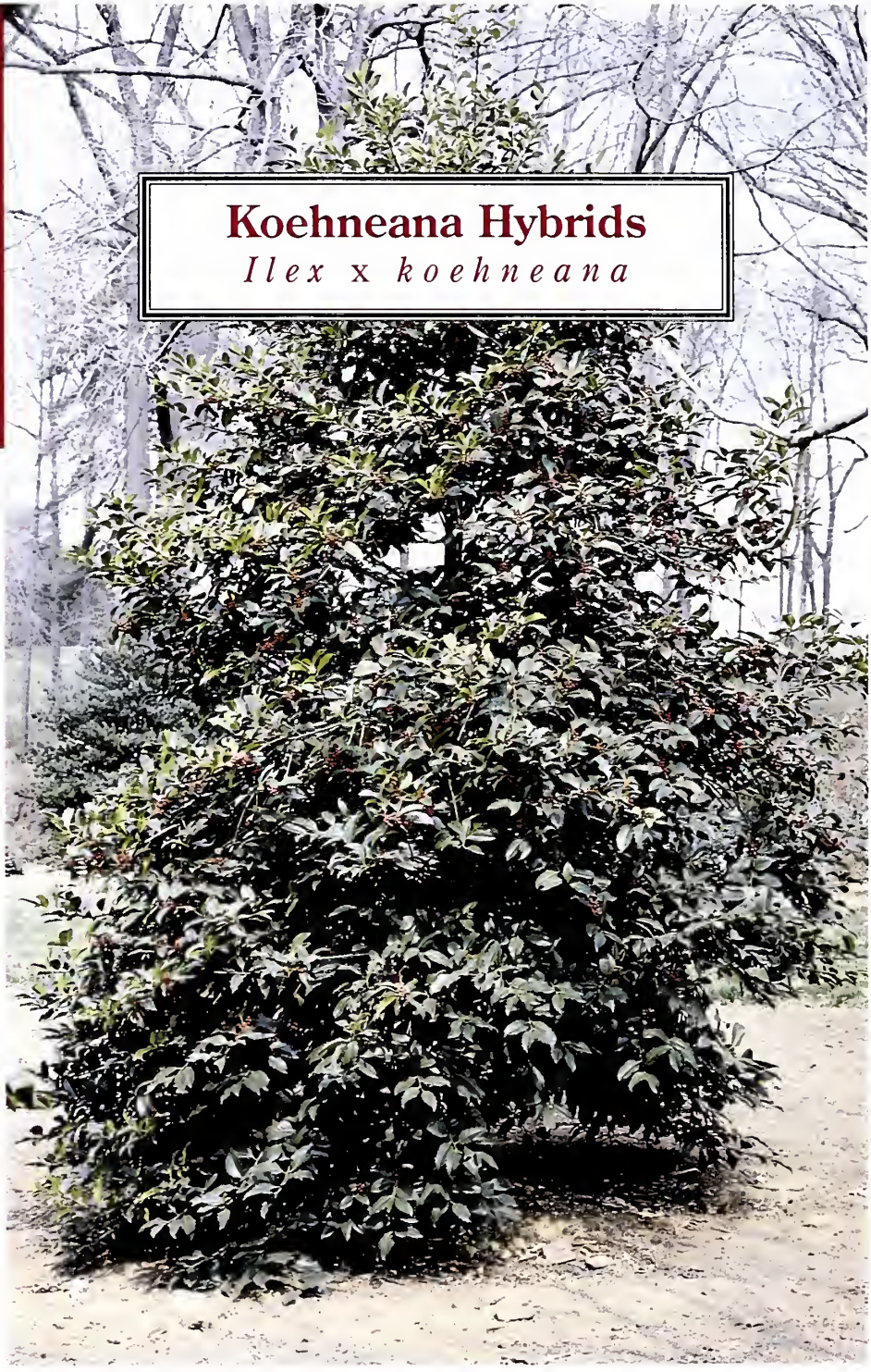
'Glory' — Hardier than most. Dense globe with tiny leaves, 5 feet tall and 8 feet wide after a dozen years or so. Male.

'Helleri' — Small leaves. Dense plant wider than high, exceeds 3 feet only after many years. Female, but few fruits.

'Highlander' — A dark green, tall plant to 10 feet or more, remarkably cold hardy. Male.

Koehneana Hybrids

Ilex x *koehneana*



Ilex x *koehneana* **'Wirt L. Winn'**

NATIVE HABITAT:

Hybrid

HARDINESS ZONE:

6b to 9

PARENTAGE:

aquifolium x *latifolia*

OUTSTANDING FEATURES:

Evergreen trees, potentially 40 feet tall or more, with red fruits.

HABIT AND USE:

The progeny of this cross, *Ilex aquifolium* x *I. latifolia*, are mostly small- to medium-sized, broadly conical trees with evergreen, leathery, dark green, usually spiny leaves 2 to 3-1/2 inches long by about 1-1/4 inches wide. Fruits are large, red and abundant.

HOW TO GROW:

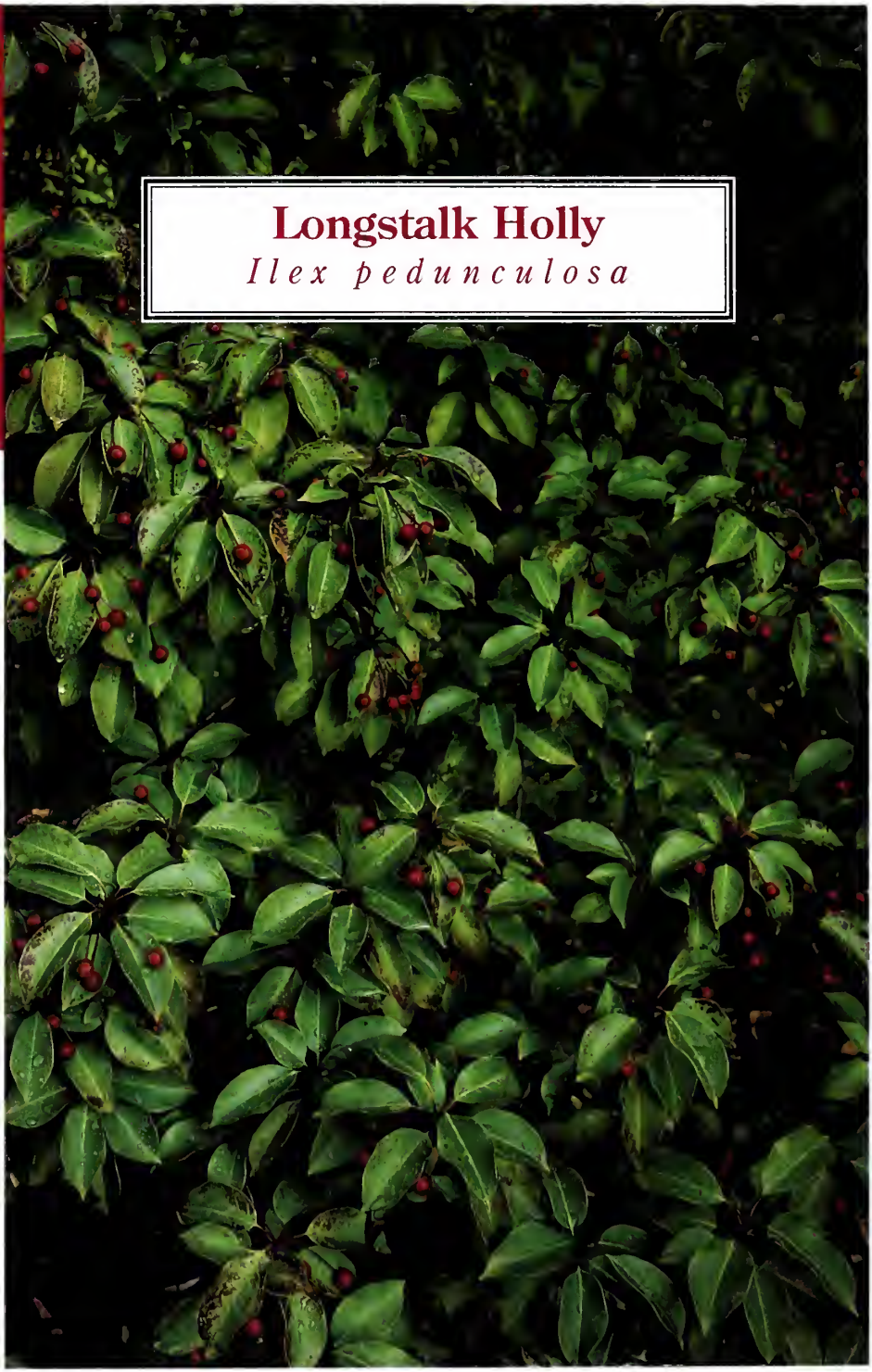
See *Ilex aquifolium* (English Holly).

VARIETIES AND RELATED SPECIES:

'Wirt L. Winn' — Conical form, 20 feet or taller. Large, lustrous, moderately spiny leaves. Good fruit display. Tolerant of heat, drought, and poorly drained soil.



Ilex x *koehneana* **'Ajax'**



Longstalk Holly

Ilex pedunculosa

NATIVE HABITAT:

China and Japan

HARDINESS ZONE:

5 to 8

OUTSTANDING FEATURES:

Fruits (on female plants) are cherry red and cherrylike on slender stalks up to 1-1/2 inches long, set off by glossy evergreen leaves resembling pear tree foliage. Upright large shrubs, 15 to 20 feet tall in time.

HABIT AND USE:

Much like American holly in shape and size, longstalk holly can be used for similar purposes such as tall hedges and specimen plants. However, because of its rarity and elegance, most are planted as "look-at-me" specimens.

HOW TO GROW:

Similar to American holly, except that longstalk holly is not susceptible to the pests mentioned with regard to American holly.

VARIETIES AND RELATED SPECIES:

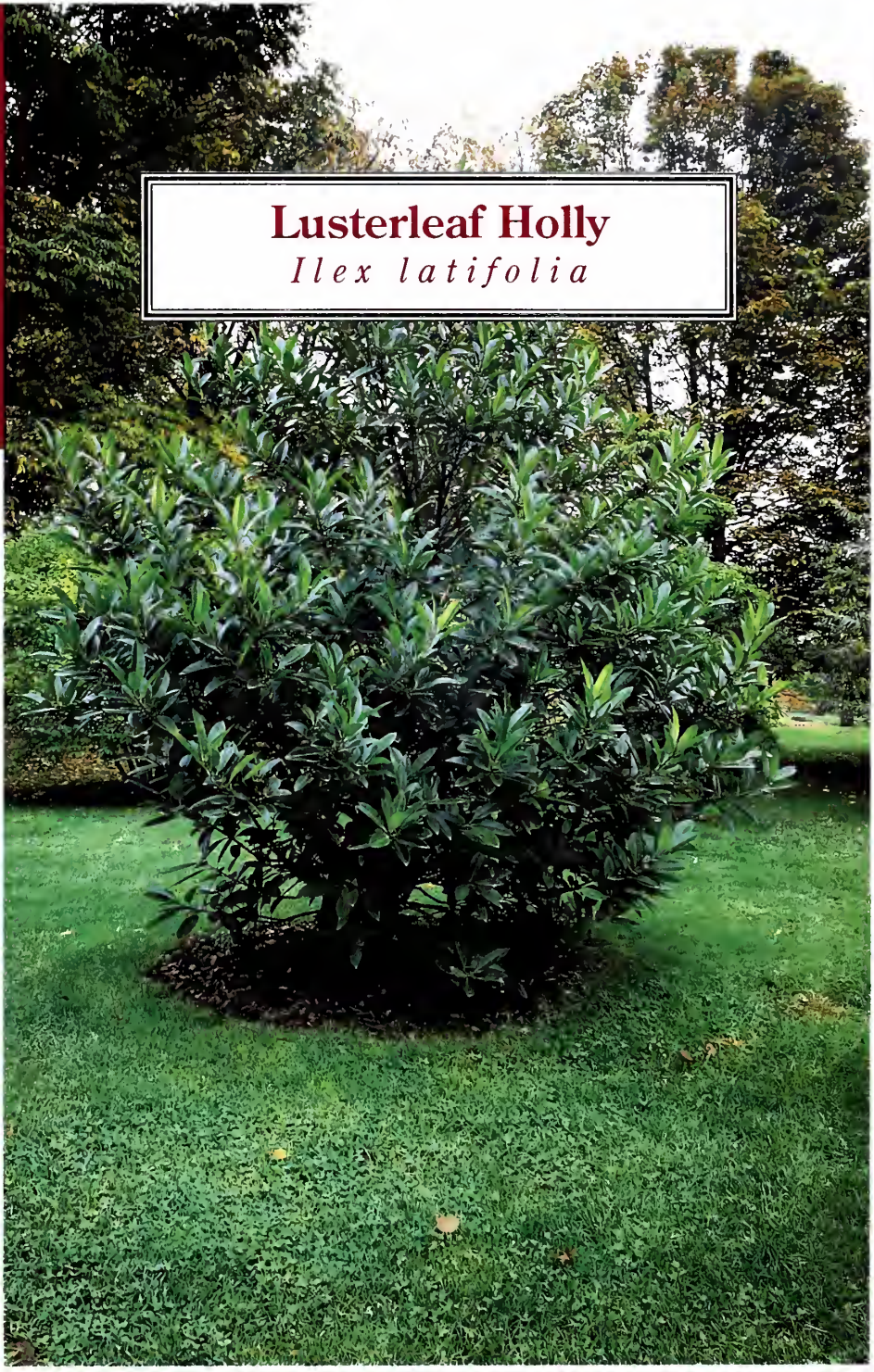
None.

Note: Requires a pollinator of the same species.



Lusterleaf Holly

Ilex latifolia



NATIVE HABITAT:

China and Japan

HARDINESS ZONE:

8 to 9

OUTSTANDING FEATURES:

Many people find it hard to believe that a 25-foot tree with leaves 6 inches long and 3 inches wide could be a holly, but such is *Ilex latifolia*. The huge (for holly) leaves are evergreen and coarsely toothed but not spiny, giving the plant the look of southern magnolia but with less messiness on the ground beneath. Dull red fruits are 1/3 inch in diameter in fat clusters on female plants in autumn.

HABIT AND USE:

This species is ideal as small shade or specimen trees. It has been used successfully in holly breeding, having been a parent of many popular cultivars, including 'Emily Bruner', 'Mary Nell,' 'Wirt L. Winn'.

HOW TO GROW:

Easy to grow in reasonably good soil, sun or partial shade. Mulching and light nitrogen fertilization are recommended.

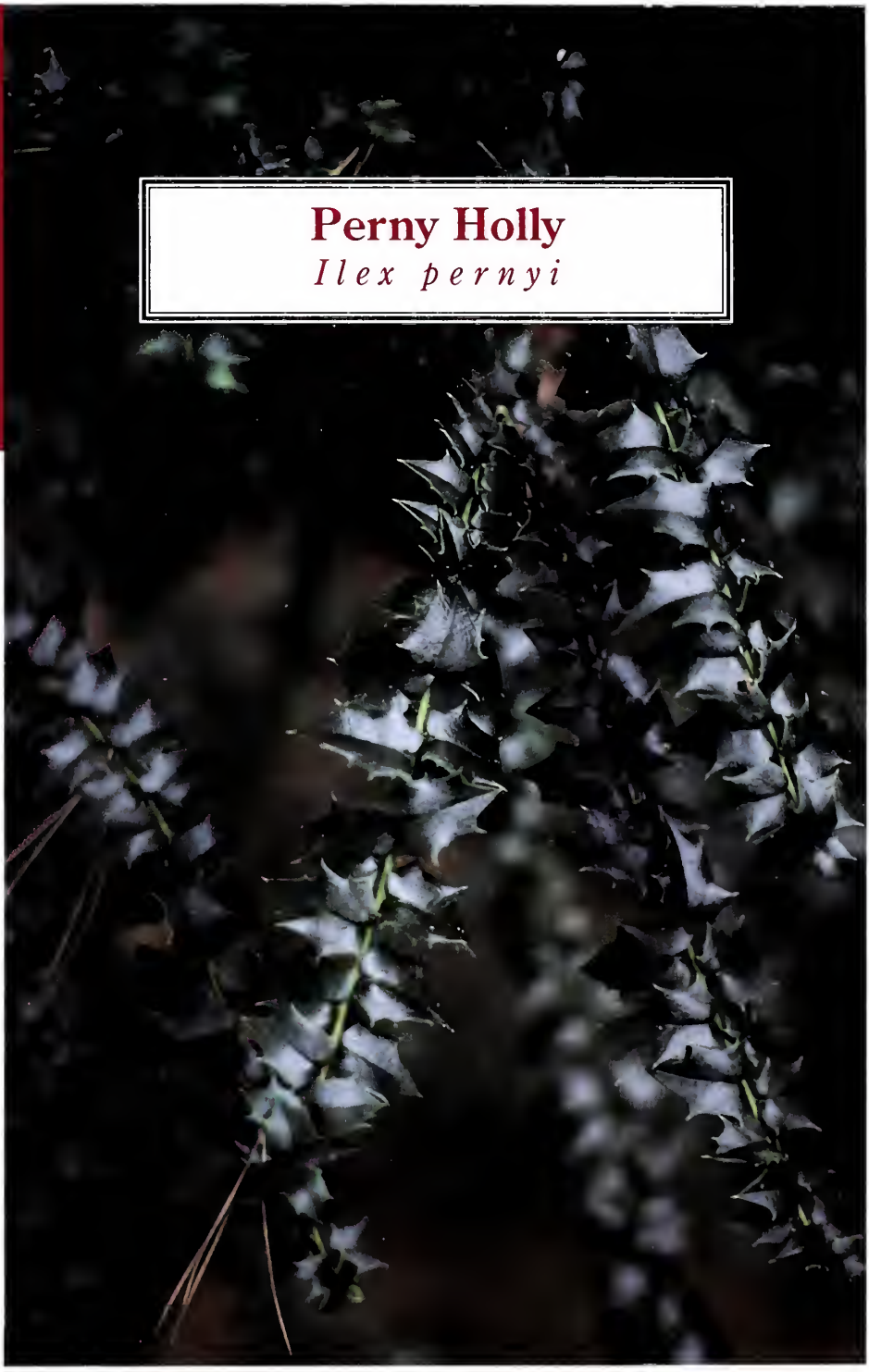
VARIETIES AND RELATED SPECIES:

See *Ilex cornuta* and *Ilex aquifolium* hybrid cultivars.



Perny Holly

Ilex pernyi



NATIVE HABITAT:

China

HARDINESS ZONE:

6b to 9

OUTSTANDING FEATURES:

Tiny, spiny evergreen leaves sit upright and crowded along stems, with bright red fruits crowded among them, on a narrow upright plant 15 feet tall — truly a collector's item for a prominent spot.

HABIT AND USE:

In addition to being used as an accent, this species has been a good parent in several holly crosses.

HOW TO GROW:

This is not a fussy species, though female plants should have sun for best fruiting, and a bit of pruning now and then will aid shapeliness. Use organic mulch; fertilize annually.

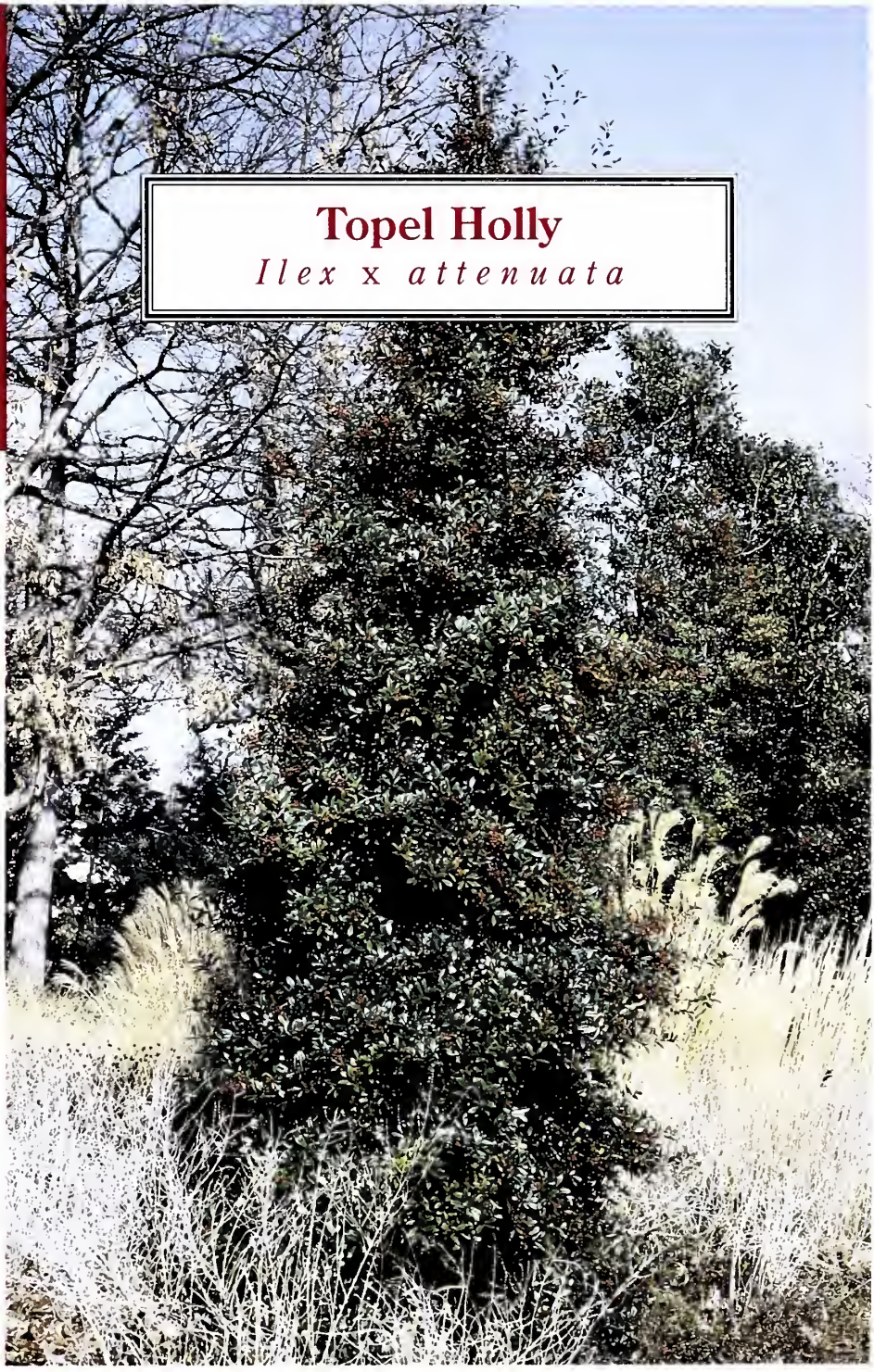
VARIETIES AND RELATED SPECIES:

See *Ilex cornuta* hybrid cultivars; also *I.* x *aquipernyi.*



Topel Holly

Ilex x *attenuata*



Ilex x *attenuata* **'Foster #2'**

NATIVE HABITAT:

Southeastern United States

HARDINESS ZONE:

6b to 9

PARENTAGE:

cassine x *opaca*

OUTSTANDING FEATURES:

This handsome group of hybrid evergreen hollies has narrow, bright green leaves with slightly spiny margins. Dark red fruits last all winter. Grows 20 to 25 feet tall.

HABIT AND USE:

Fine-textured, slender conical form makes these hybrids useful for specimens, corner plantings and screens.

HOW TO GROW:

Good soil, full sun and gentle pruning give best results. See American Holly. Relatively pest free.

VARIETIES AND RELATED SPECIES:

'Foster #2' — Excellent foliage, lots of red fruits. 20 feet tall or more. Hardy in Zone 6b.

'Foster #4' — A good male for pollen. Zone 6b.

'East Palatka' — A popular holly with larger fruits and leaves than those of the Fosters, but cold hardy only to Zone 7a. Leaves are essentially spineless.

'Aurantiaca' — Has great masses of large orange fruit.

'Bright Horizon' — A compact plant, 6 feet tall and 2-1/2 feet wide after 12 years. Large (1/2 inch) red fruits.

'Cacapon' — Grows to 8 feet tall. Crinkled, dark green leaves and plenty of dark red fruits.

'Earlibright' — Produces early, orange-red fruits. An upright plant, about 7 feet tall and half as wide.

'Jackson' — A male pollinator for many northern female cultivars. Good foliage. Narrow upright plant to 10 feet tall.

'Red Sprite' — Also known as 'Nana' and 'Compacta'. Compact slow grower to 5 feet tall with large red fruits.

'Simpson's Early Male' — Pollinator for southern-type females.

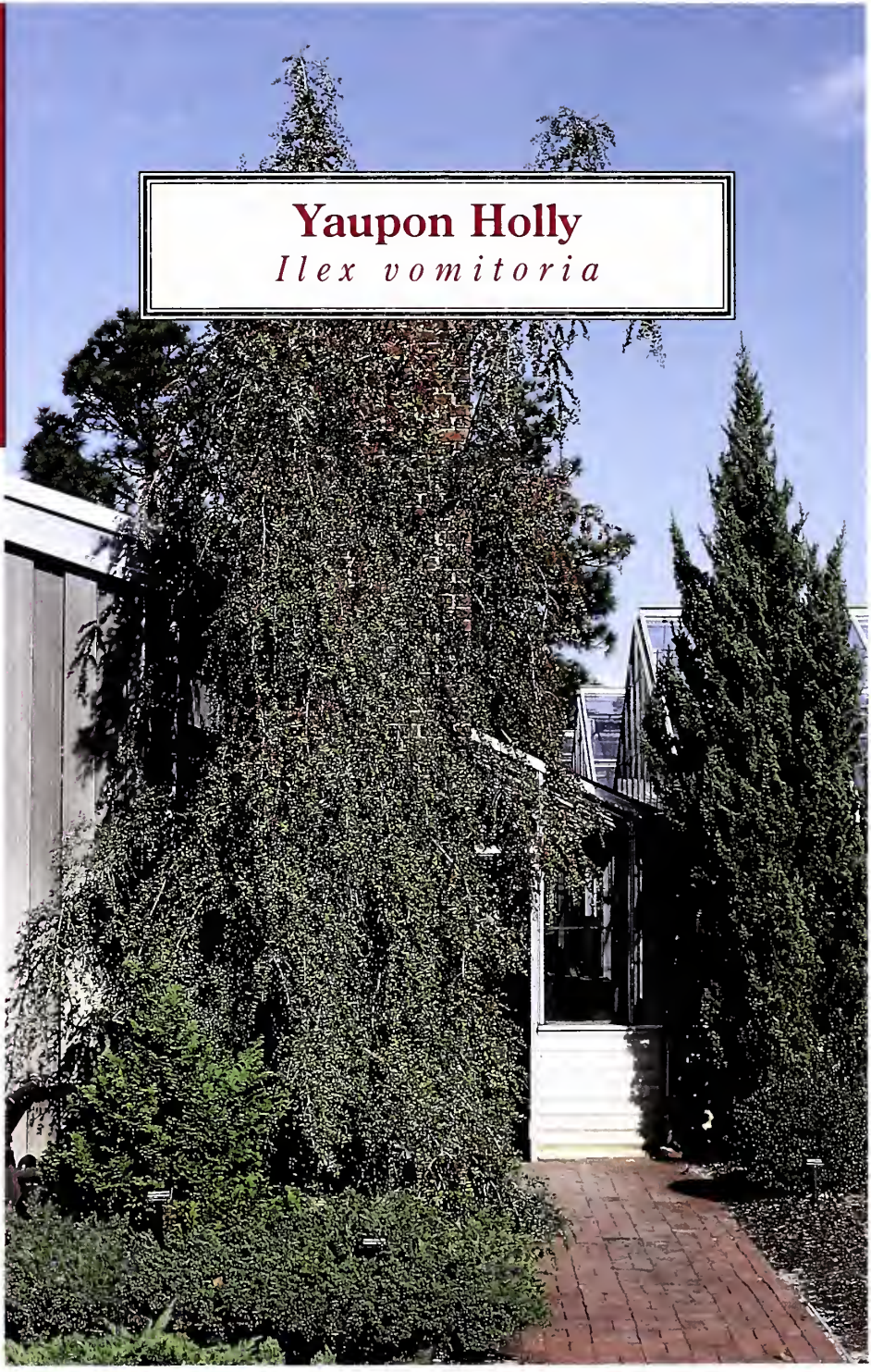
'Stop Light' — Formerly 'Hopperton'. Good foliage, large half-inch berries, light gray stems.

'Sunset' — Large, dark green leaves to 6 inches. Spreading bush becoming 6 feet high and 8 feet wide. Abundant reddish orange fruits.

'Winter Red' — A wonderful cultivar, 8 feet tall after many years. Lustrous dark green foliage. Abundant and persistent rich red fruits. Cut twigs stay beautiful for months indoors without water.

Yaupon Holly

Ilex vomitoria



PATRICIA JOSEPH

Ilex vomitoria **'Pendula'**

NATIVE HABITAT:

Southeastern United States

HARDINESS ZONE:

7b to 9

OUTSTANDING FEATURES:

Small but shiny and translucent fruits and glossy, dark green evergreen leaves of modest size (1/2 to 1-1/2 inches long, half as wide). Attractive gray-white bark. Picturesque informal shrubs or small trees 15 to 20 feet tall. Medium to fast growth rate.

HABIT AND USE:

Yaupons are versatile, serving well as specimens, foundation plantings, hedges, screens, backdrops for smaller plants, mass plantings, wall plants, espaliers and topiary. There are dwarf, upright and weeping forms.

HOW TO GROW:

Easy to transplant, drought and heat resistant. Will grow in soils from alkaline to acidic and from dry to swampy. Tolerant of salt spray. Use organic mulch. Easy-does-it with nitrogen fertilization and pruning (shear for formal hedges only). Free from pest and disease problems. Yaupons are dream plants.

VARIETIES AND RELATED SPECIES:

'Folsom's Weeping' — A small tree with long pendulous branches and red fruits. Similar plants are 'Gray's Weeping' and 'Pendula'. Both male and female weeping forms are available.

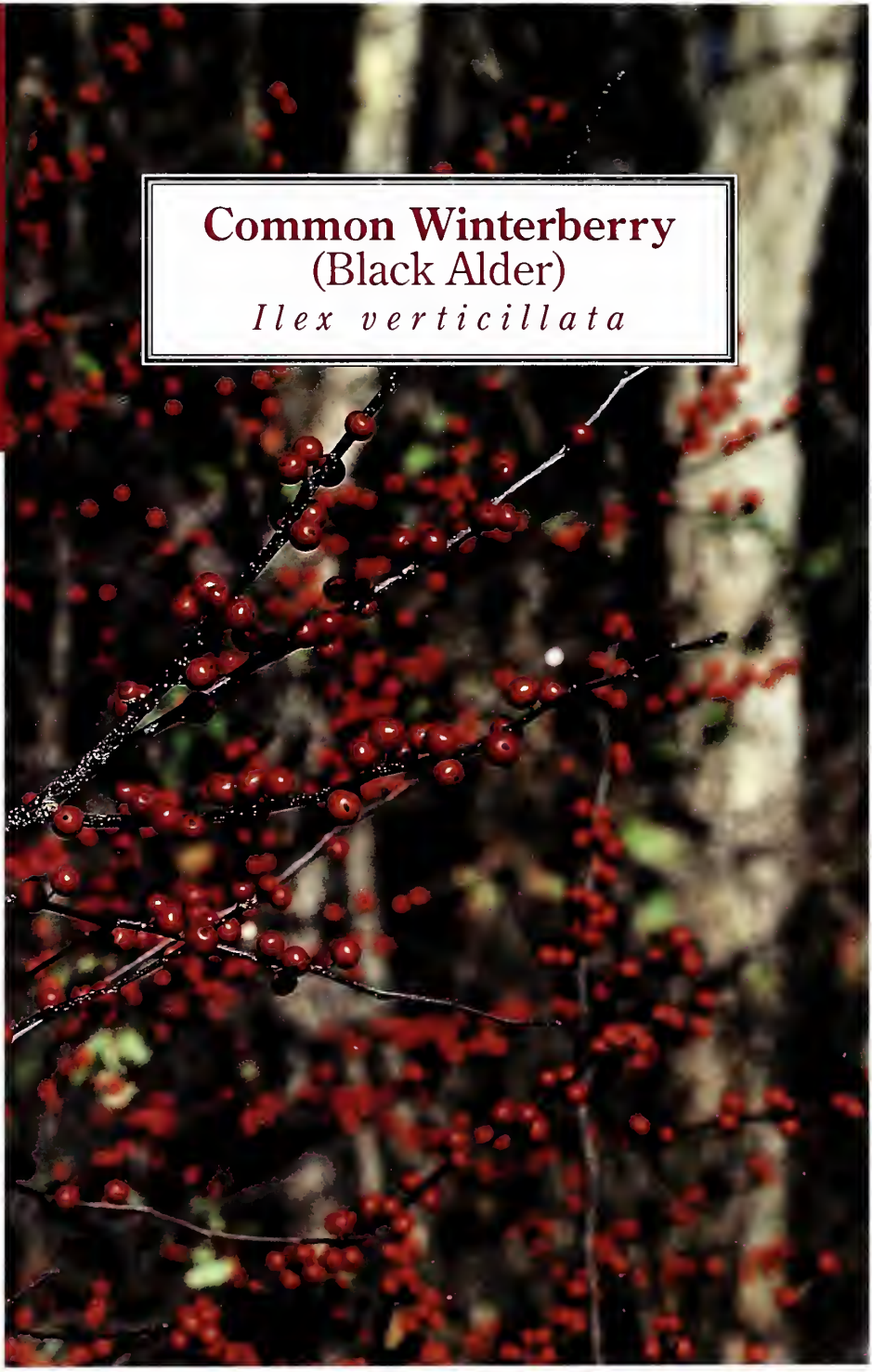
'Gray's Greenleaf — An upright spreading small tree with red fruits.

'Jewel' — A medium to large shrub with horizontal branching, red fruits and attractive gray stems.

'Nana' — One of several low-growing cultivars easily kept at 3- to 5-foot height for many years with light pruning. Similar cultivars ('Compacta', 'Schillings Dwarf' and 'Stokes Dwarf') are often confused in the nursery trade.

'Shadow's Female' — A large shrub or small tree with large, dark green leaves and red fruits. More cold hardy than many other cultivars (Zone 7a).

'Yellow Berry' — A cultivar with yellow fruits; others are 'Wiggins Yellow' and 'Yawkey'.



Common Winterberry
(Black Alder)
Ilex verticillata

NATIVE HABITAT:

Nova Scotia and New England, west to Minnesota and south to Florida and Texas

HARDINESS ZONE:

4 to 9a

OUTSTANDING FEATURES:

Deciduous shrubs of varying characteristics, from 4 to 15 feet tall. Females bear fruits 1/4 inch or larger in shades of red and orange, rarely yellow. Most experts agree this species includes "northern" and "southern" types. Northern types have many light brown stems, smallish leaves and a moderate growth rate. They bloom 2 to 3 weeks later than the southern types. Southern plants have larger, thicker leaves, darker stems and more open and faster growth. For pollination, females need males from the same geographic group.

HABIT AND USE:

Cultivars offer a range of shrubby plants, from small to large, for foundations, corners, borders, screens and naturalizing, and for cut branches that hold their "berries" beautifully indoors without water. They also make good specimen plants. To attract birds, plant red-fruited cultivars rather than orange or yellow ones.

HOW TO GROW:

Growth is best in moist, water-retentive soil (muck, clay, clay-loam), slightly acidic, in full sun. Some cultivars are drought-tolerant; most will benefit from irrigation during dry spells. All will respond well to organic mulch over root zones.

VARIETIES AND RELATED SPECIES:

N = northern type; S = southern

'Afterglow' — N. A compact shrub, 10 feet high and wide after 30 years. Glossy green leaves, plentiful orange-red fruits. One of the cold hardier selections.

'Aurantiaca' — N. Great masses of large orange fruit on a smallish bush.

'Bright Horizon' — S. Herringbone branching on a compact plant, 6 feet tall and 2 1/2 feet wide after 12 years. Large red fruits.

'Cacapon' — N. Grows to 8 feet tall. Crinkled dark green leaves, plenty of dark red fruits.

'Earlibright' — N. An early fruiting, upright plant about 7 feet tall and half as wide. Fruits are orange-red.

'Stop Light' (formerly 'Hopperton') — N. Good foliage, large berries, light gray stems.

'Jackson' — N. A male pollinator for many northern female cultivars. Good foliage. Narrow upright plant to 10 feet tall.

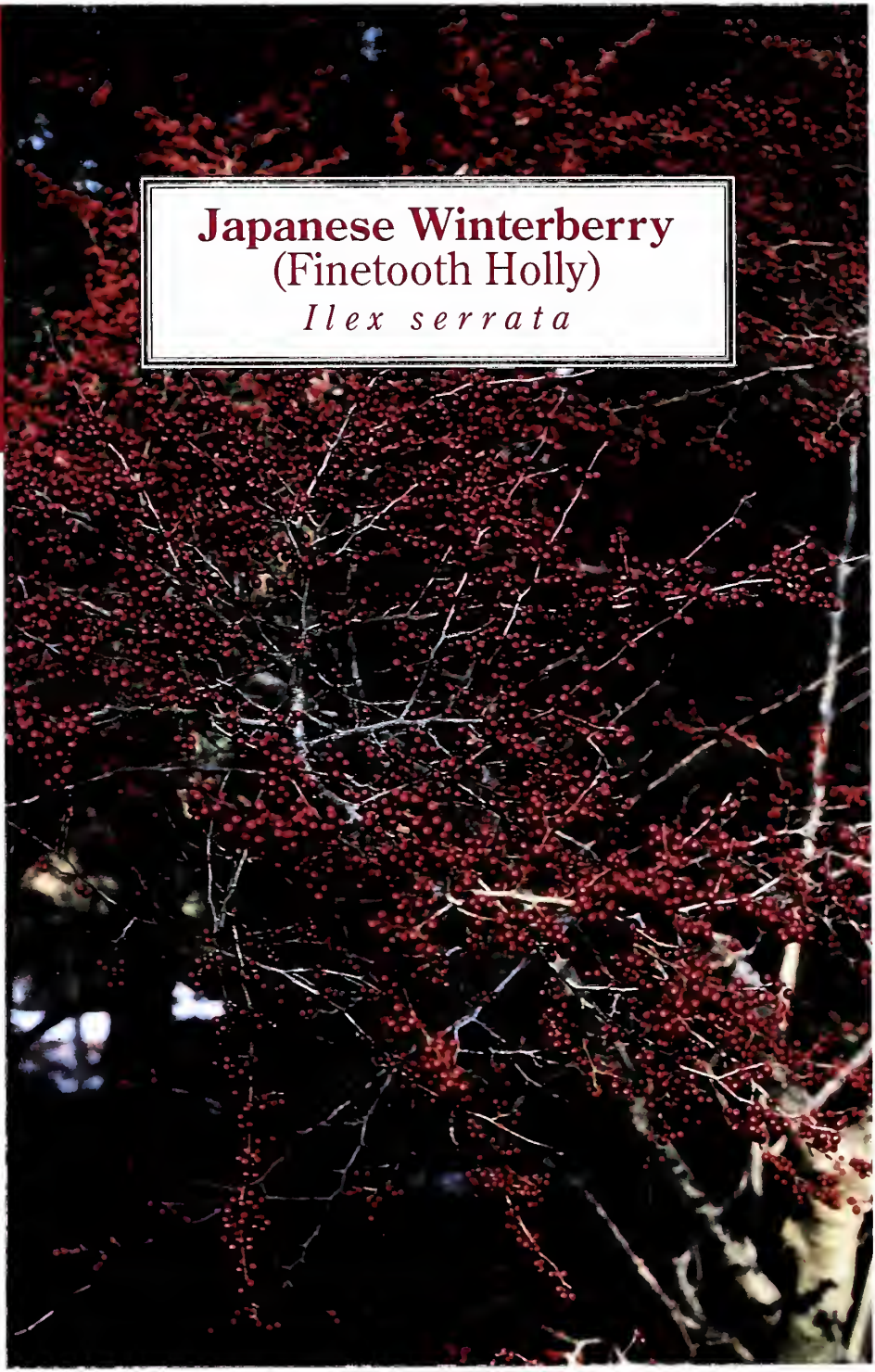
'Red Sprite' (aka 'Nana' and 'Compacta') — N. Compact, slow grower to 5 feet with large red fruits.

'Simpson's Early Male' — S. Midseason to late pollinator for southern-type females.

'Sunset' — S. Large dark green leaves to 6 inches. Spreading bush becoming 6 feet high and 8 feet wide. Abundant reddish orange fruits.

'Winter Red' — S. A marvelous cultivar, 8 feet tall after many years. Lustrous dark green foliage. Its rich red fruits are abundant and very persistent. Cut twigs stay beautiful for months indoors without water.

Japanese Winterberry
(Finetooth Holly)
Ilex serrata



NATIVE HABITAT:

Japan and China

HARDINESS ZONE:

5b (or 6) to 8.

OUTSTANDING FEATURES:

A deciduous shrubby species of fine texture, 10 to 15 feet tall. Female plants have profuse displays of small red fruits (3/16 inch across, rarely white or yellow) if an *I. serrata* male is nearby. The fruits appear in late summer before leaves drop and persist for some time.

HABIT AND USE:

These medium to large rounded shrubs are good for naturalizing and massing, and cut branches are great for arrangements. Horticulturists have crossed this species with *Ilex verticillata,* producing some notable cultivars.

HOW TO GROW:

Best in moist sites, sunny or partially shady. Use organic mulch generously, about 3 inches thick. Fertilize annually.

VARIETIES AND RELATED SPECIES:

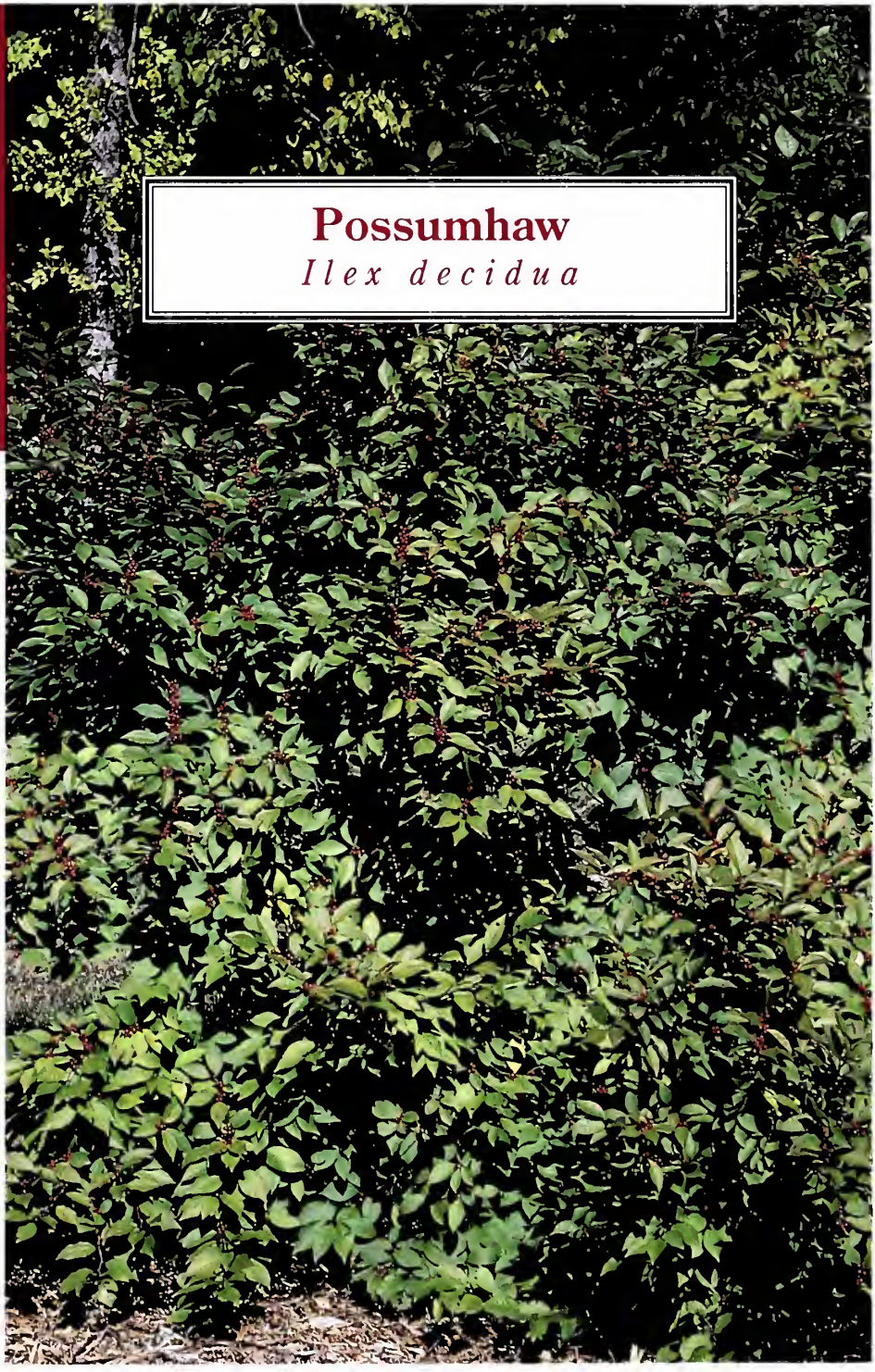
Few cultivars exist in commerce, though some may be seen at U. S. National Arboretum and some other public gardens.



Ilex serrata **'Sundrops'**

Possumhaw

Ilex decidua



Ilex decidua **'Warren Red'**

NATIVE HABITAT:

Maryland to central Illinois, south to Florida and Texas

HARDINESS ZONE:

5b to 9a

OUTSTANDING FEATURES:

Considered by some the showiest of all native deciduous hollies, this species is a vigorous large shrub or small tree (as tall as 25 feet or more) with rich, glossy green foliage and profusions of glossy fruits from deep red to orange and (rarely) yellow. Stems are usually light gray and attractive, especially in winter. Pollination of female plants is by males of the species, or by males of *Ilex opaca* (American Holly) which bloom at the same time.

HABIT AND USE:

This species is adaptable to pruning into small trees with single or several trunks. Large shrub forms (not tree-trained) are effective for screens, background plantings and naturalizing. The fruits and light gray bark are particularly lovely against a backdrop of needled evergreens.

HOW TO GROW:

Adapts well to a wide range of soil conditions, except high alkalinity. See common winterberry.

VARIETIES AND RELATED SPECIES

'Council Fire' — A sturdy rounded large shrub to 15 feet tall with dark green leaves and plentiful dark red fruits.

'Pocahontas' — Abundant large red fruit cover the silvery gray branches of this 16-foot upright small tree.

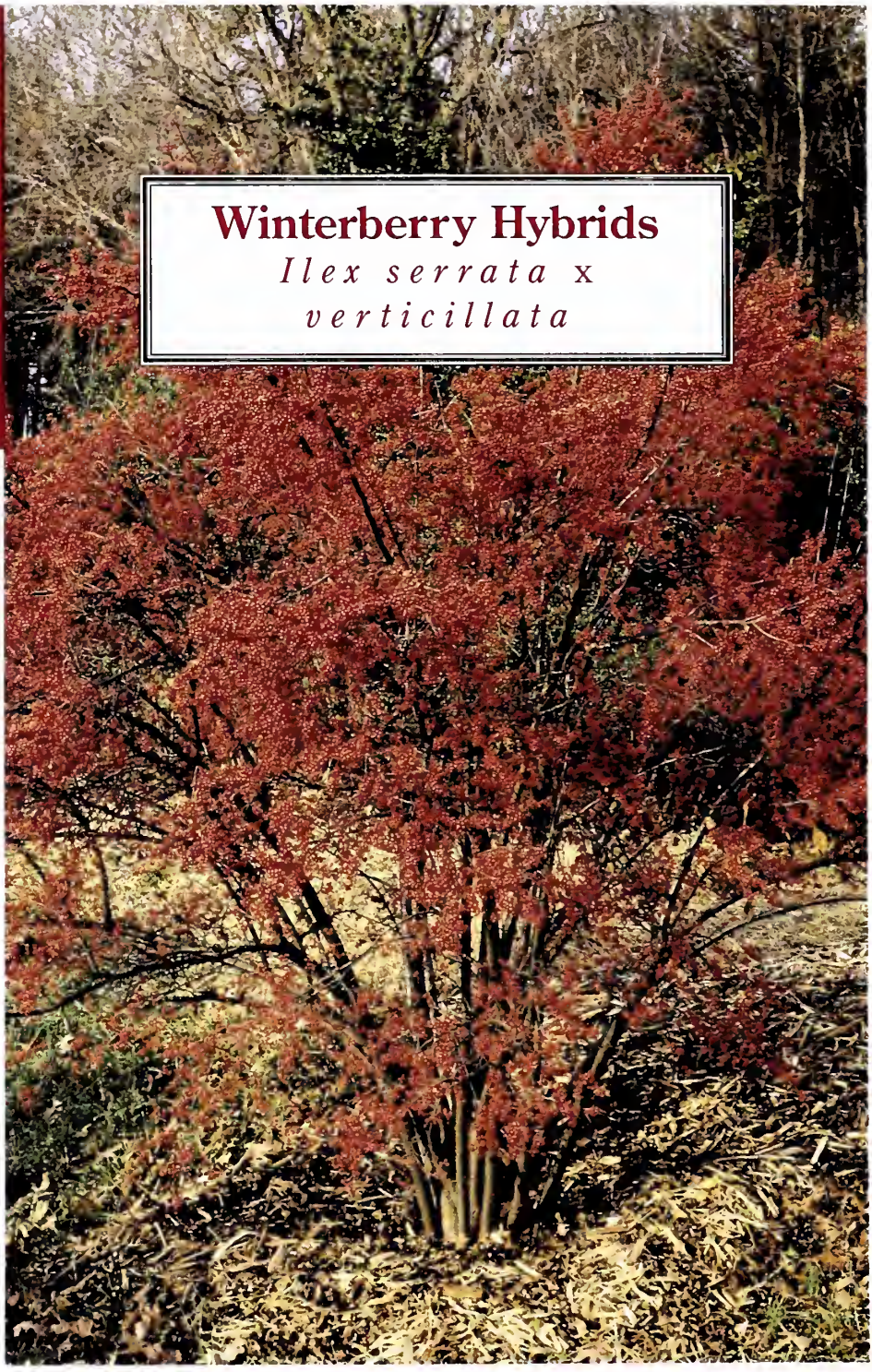
'Red Cascade' — Large shrub to 15 feet or more with broad, glossy green leaves, large persistent red fruits and silvery white bark.

'Red Escort' — A male for pollinating. Dense, vigorous, large shrub with excellent foliage.

'Warren Red' — A broad arching form to 18 feet or more, with great quantities of shiny red fruit and lustrous dark green foliage. An outstanding cultivar.

Winterberry Hybrids

Ilex serrata x *verticillata*



Ilex serrata x *verticillata* **'Sparkleberry'**

NATIVE HABITAT:

Hybrid

HARDINESS ZONE:

5 to 8

OUTSTANDING FEATURES:

Vigorous, slender-branched deciduous shrubs from 8 feet to 12 feet tall with attractive foliage. Females bear vivid red fruits in abundance before and after leaf drop, providing spectacular displays.

HABIT AND USE:

Named selections are useful in masses, bank plantings, mixed or monocultural borders and backdrops for smaller plants.

HOW TO GROW:

Site requirements and cultural tips are similar to those for *Ilex verticillata* (common winterberry). Pruning in early spring before new growth will control size and increase compactness without diminishing fruiting.

VARIETIES AND RELATED SPECIES:

'Apollo' — A fine consistent pollinator (male).

'Bonfire' — Vigorous, spreading form, 10 feet high or more at maturity, loaded with scarlet-red fruits.

'Harvest Red' — Deep red fruits hold color exceptionally well on a bush maturing at 12 feet.

'Sparkleberry' — A vigorous, upright plant 10 to 12 feet tall with brilliant red fruits that last all winter.



Ilex **'Sparkleberry'**

Recommended Hollies by Region

Northeast

(primarily coastal areas)

Ilex opaca — American holly, hardy cultivars
Ilex x *meserveae* — Blue holly
Ilex glabra — Inkberry
Ilex pedunculosa — Longstalk holly
Ilex verticillata — Common winterberry
Ilex pernyi — Perny holly



Ilex opaca



Ilex x *meserveae*

Mid-Atlantic

Ilex aquifolium — English holly
Ilex x *altaclerensis*— Highclere holly
Ilex aquifolium x *cornuta*, 'Nellie R. Stevens'
Ilex crenata — Japanese holly
Ilex glabra — Inkberry
Ilex x *meserveae* — Blue holly
Ilex opaca — American holly
Ilex serrata x *verticillata* — Winterberry hybrids



Ilex aquifolium



Ilex x *altaclerensis*

Southeast

Ilex opaca — American holly
Ilex crenata — Japanese holly
Ilex cornuta — Chinese holly
Ilex vomitoria — Yaupon holly
Ilex x *attenuata* — Topel holly
Ilex x *aquipernyi* — Aquipern holly
Ilex aquifolium x *cornuta* 'Nellie R. Stevens'
Ilex decidua — Possumhaw
Ilex verticillata — Common winterberry
Ilex serrata x *verticillata* — Winterberry hybrids



Ilex crenata



Ilex cornuta

Lower South

(Zone 9, not 10)

Ilex x *altaclerensis* — Highclere holly
Ilex x *koehneana*, 'Wirt L. Winn' — Koehneana hybrid
Ilex x *attenuata* 'East Palatka' — Topel holly
Ilex vomitoria — Yaupon holly
Ilex cornuta — Chinese holly



Ilex x *koehneana*



Ilex x *attenuata*

Midwest

Ilex opaca — American holly
Ilex pedunculosa — Longstalk holly
Ilex glabra — Inkberry
Ilex x *meserveae* — Blue holly
Ilex crenata — Japanese holly (in warmer portions of Midwest)
Ilex decidua — Possumhaw
Ilex verticillata — Common winterberry
Ilex serrata x *verticillata* — Winterberry hybrids



Ilex pedunculosa



Ilex glabra

Central Plains

(Zones 5, 6)

Ilex opaca — American holly
Ilex glabra — Inkberry
Ilex x *meserveae* 'Blue Girl', 'Blue Princess' — Blue holly
Ilex cornuta x *rugosa* 'China Girl', 'China Boy' — Chinese holly hybrids



Ilex opaca



Ilex x *meserveae*

Rocky Mountains

(Denver, Colorado, in protected areas with modified soil)

Ilex x *meserveae* — Blue holly
Ilex glabra — Inkberry
Ilex pedunculosa — Longstalk holly
Ilex verticillata 'Winter Red' — Common winterberry



Ilex pedunculosa



Ilex verticillata

West Coast

(California)

Ilex cornuta 'Berries Jubilee', 'Burfordii', 'Dwarf Burford' — Chinese holly
Ilex crenata 'Compacta' — Japanese holly
Ilex vomitoria 'Nana', 'Stokes Dwarf' — Yaupon holly
Ilex x *aquipernyi* 'San Jose' — Aquipern holly



Ilex crenata



Ilex x *aquipernyi*

Pacific Northwest

Ilex aquifolium — English holly
Ilex x *meserveae* — Blue holly
Ilex crenata — Japanese holly
Ilex pedunculosa — Longstalk holly
Ilex x *aquipernyi* 'San Jose' — Aquipern holly
Ilex decidua — Possumhaw
Ilex verticillata — Common winterberry



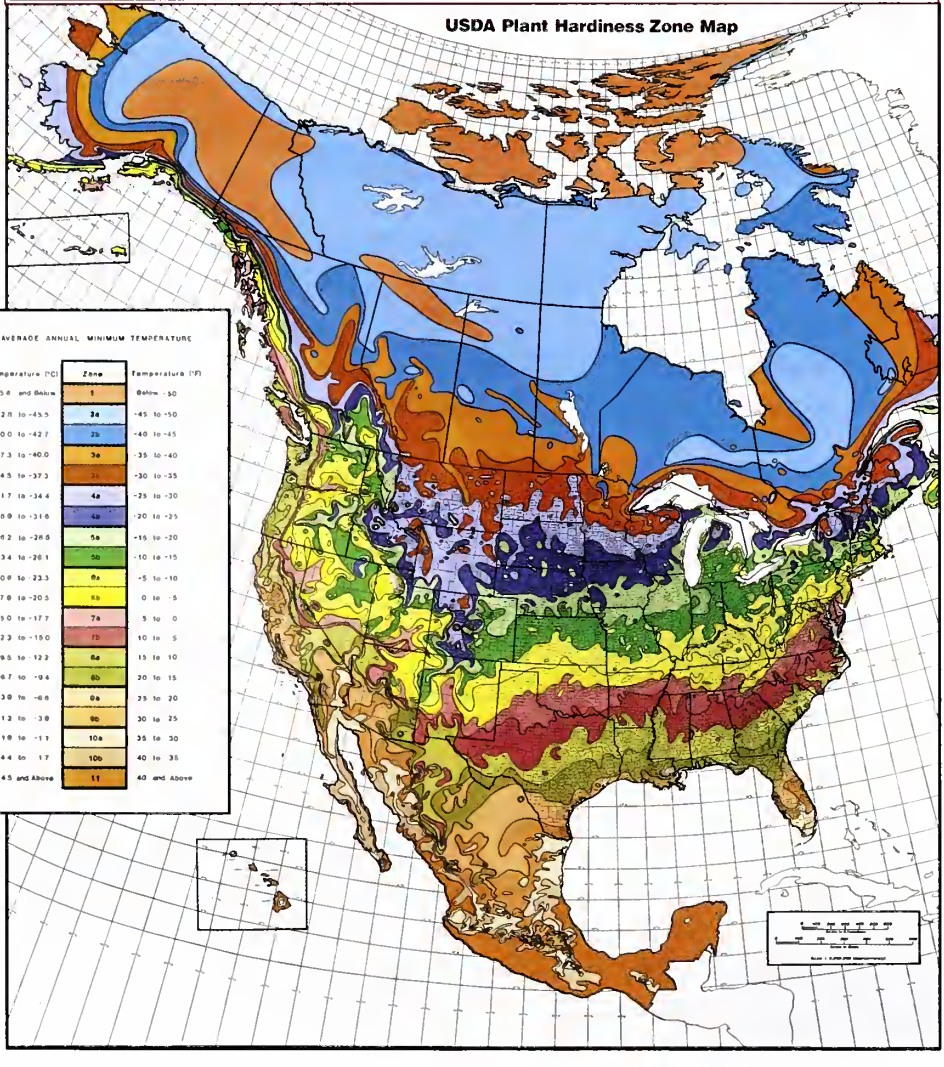
Ilex aquifolium



Ilex verticillata

Hardiness Zone

Map



WHY JOIN HOLLY SOCIETY OF AMERICA? HOW?

If you travel, have babies or shoot pool, you likely enjoy exchanging experiences and information with others who do the same.

If you grow hollies, or at least enjoy seeing hollies, then surely you will want to meet other holly people, and receive printed material with holly information. Holly Society of America offers regular national and regional meetings and produces a quarterly *Holly Society Journal* and other publications devoted to holly. For information, write or call: Linda R. Parsons, Secretary, **HOLLY SOCIETY OF AMERICA,** 11318 West Murdock, Witchita, KS 67212-6609; (316) 721-5668.

SOURCES OF HOLLY

Holly Society of America maintains a list of more than 50 sources for some 400 species, hybrids and cultivars. The list indicates whether nurseries are wholesale or retail, and whether the latter will ship plants. The source list costs $2 and is available from Linda R. Parsons, Secretary of HSA, 11318 West Murdock, Witchita, KS 67212-6609, or from C. L. Dickinson, HSA, 37 Blackjack Rd., Hendersonville, NC 28739.

Members of the Holly Society are famously generous with cuttings, and sometimes plants. A popular event at annual meetings of HSA is the "Holly Exchange Program." Members bring cuttings of their favorite hollies to share.

HOLLY PLACES

Official holly arboreta and test tenters are wonderful places for viewing and enjoying hollies. Send a stamped, self-addressed envelope to Publications Department, Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, NY 11225, Attention: Official Holly Arboreta and Test Centers.

Some public parks in east-coastal and east-mountainous states feature native hollies in native habitats. Travel bureaus can help you find them.

Two spectacular native forests of primarily American holly, *Ilex opaca*, are Sunken Forest at the Fire Island National Seashore, reached by ferry from Sayville, Long Island, NY; and Sandy Hook Park on the seacoast of Monmouth County, NJ.

Information about Sunken Forest, which also harbors inkberry, *Ilex glabra*, and other native trees and shrubs, is available from Sailors Haven Visitors Information, (516) 597-8980. Sandy Hook, part of Gateway National Recreation Area, is a peninsula jutting into the Atlantic Ocean. It is open daily; there is an admission charge from Memorial Day to Labor Day.

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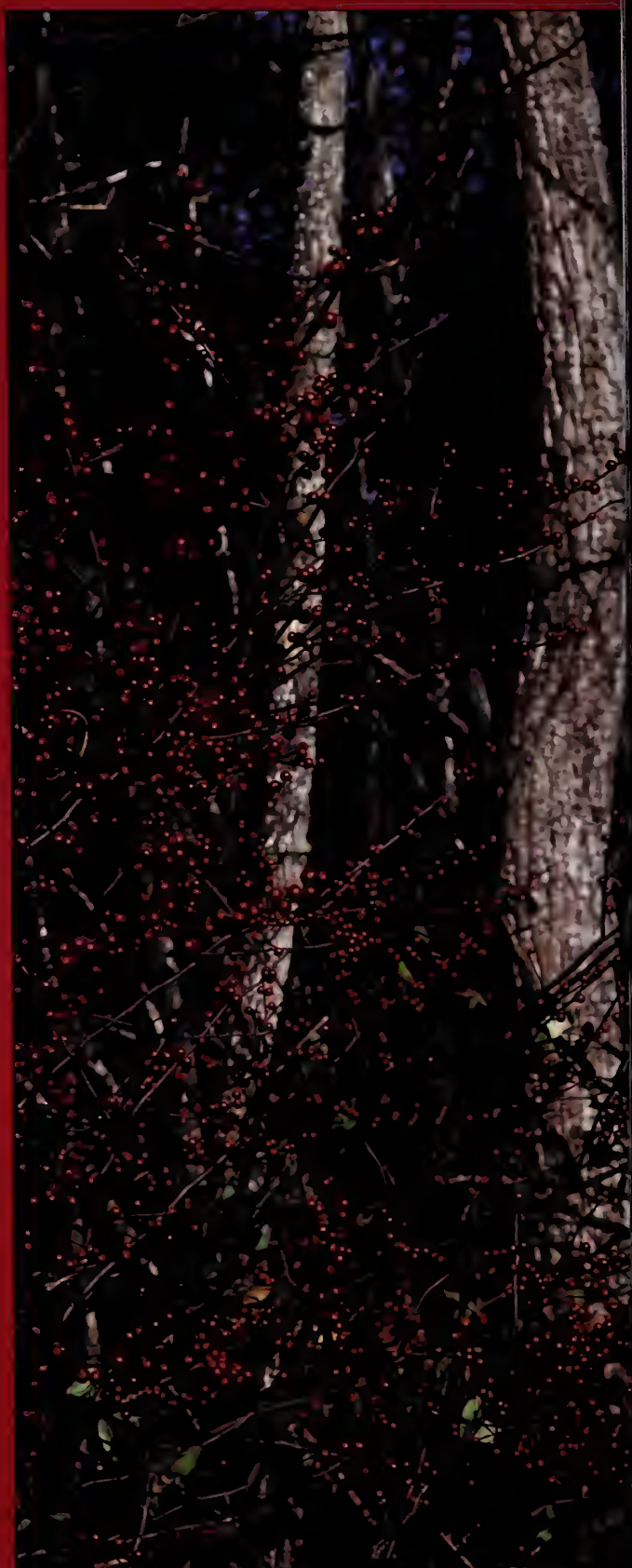
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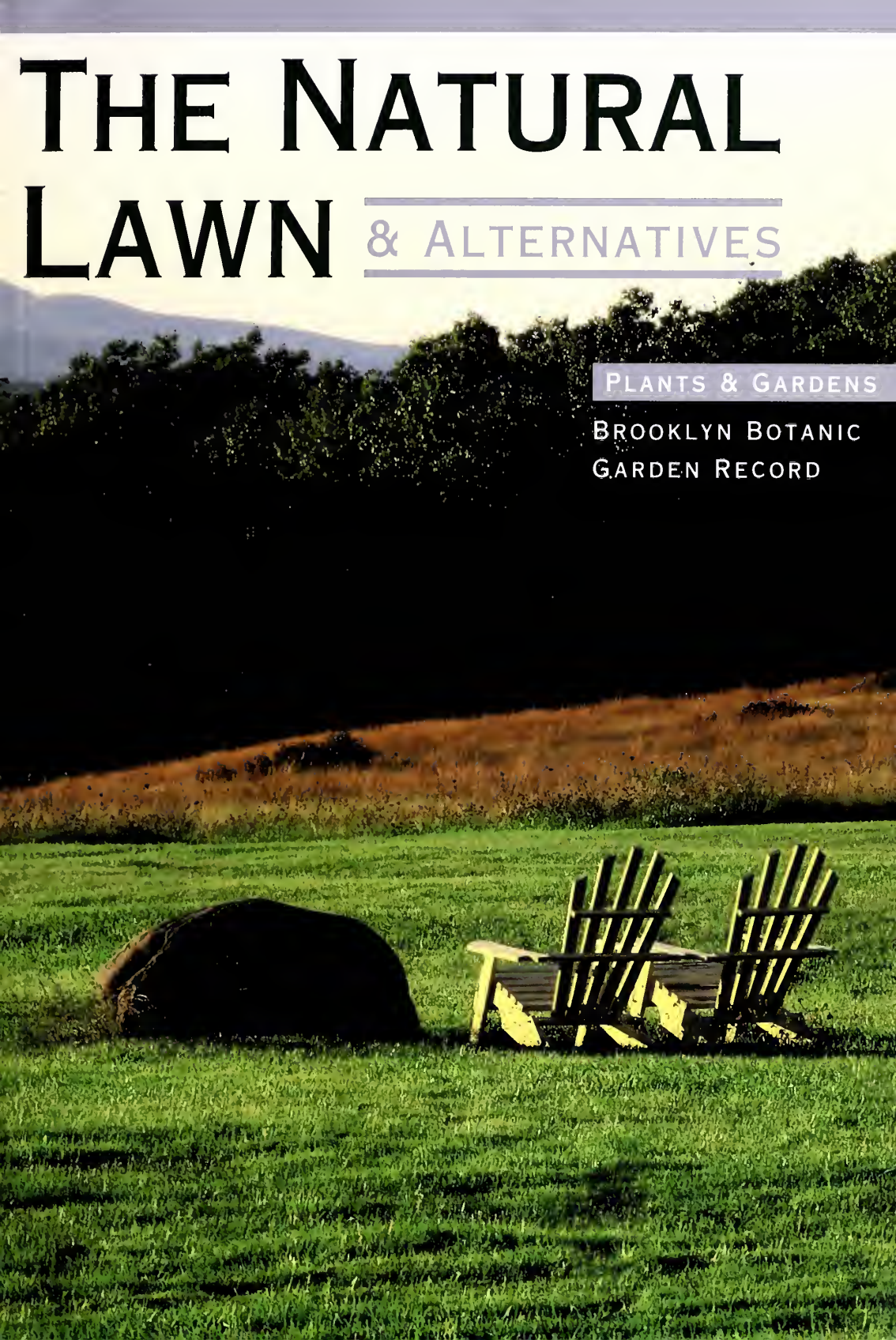
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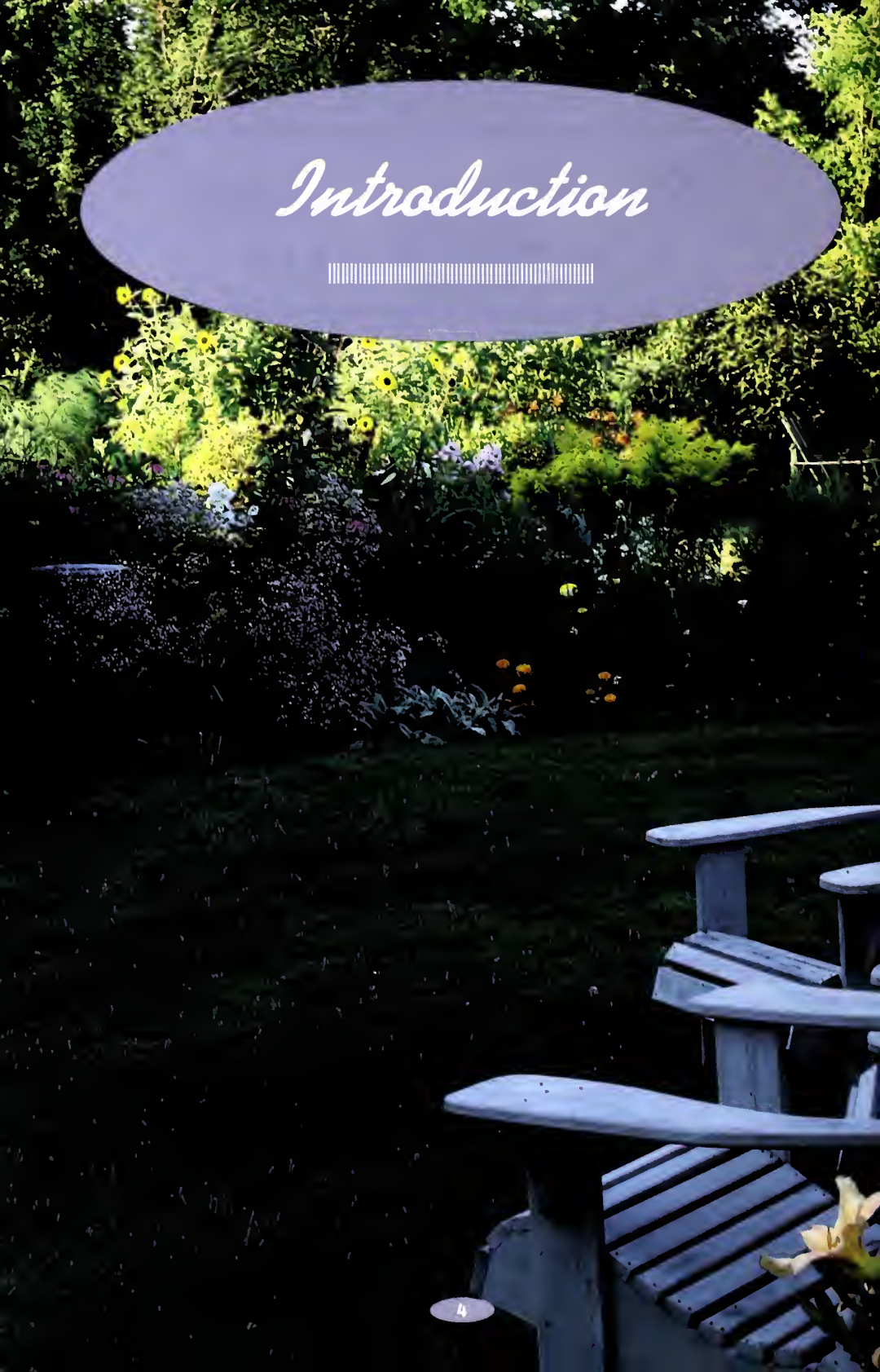
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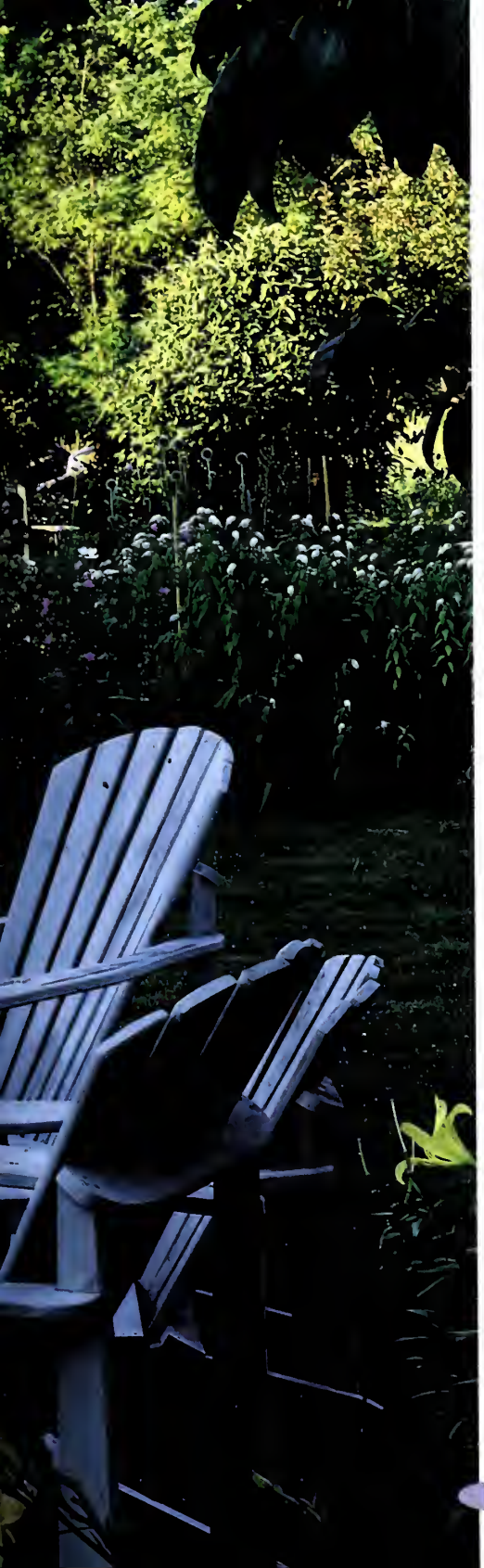
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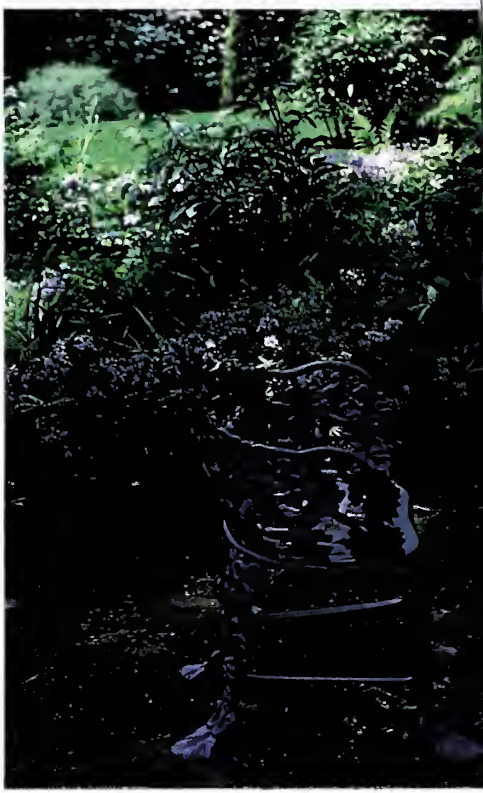
Introduction



We get red in the face pushing the mower around week after week, determined to keep the green, green grass of home in check. Instead of treating it like the rest of our landscape plants and encouraging flowers, fruit and seeds to be set, we thwart its sex drive again and again with our noisy, violent rounds.

Between beheadings, though, we water the grass like crazy and, several liberally applied times a season, force-feed the lawn, urging the same blades we crewcut into submission to grow, grow, grow.

What's wrong with this picture? Plenty, I think, starting with our schizoid dilemma: do we want the grass to grow, or do we want to make it stop?



America's love affair with the lawn borders on a fatal attraction — though it needn't be that way, as this handbook proposes and I hope proves. Under the guise of beautifying the postwar suburban sprawl that we built in the name of progress, we fell too deeply in love to think clearly. And it goes way beyond the grow/don't grow conundrum.

The Environmental Protection Agency estimates that 70 million pounds of active pesticide ingredient (the vast part of each bag you buy, the filler, isn't even counted in that total) is used each year by Americans to treat their 40 million acres of precious turf. In pursuit of what amounts to a living Astroturf — unreasonably perfect in every way, please, without a weed or blemish — we spend $6.9 billion a year (1991 figures) on do-it-yourself products alone, says the nonprofit National Gardening Association in Vermont. And we spend lots more hiring professionals to do the work for us, too.

A hard change is gonna come, and in fact is already under way in many corners of this nation, and it is being staged by gardeners like the ones represented in this volume. This handbook celebrates the start of the lawncare revolution, offering tips on how to care for your traditional lawn in a safer way, and alternatives for various regions of the country should you be among those ready to unshackle yourself from the mower at last, and try planting something besides grass.

Chemical-free lawncare is being touted as being to the 90s what recycling was to the 80s — the thing to do, the savvy way to handle things. Exciting developments like safer remedies for problems and grass breeds that grow slower, greener and healthier naturally, are making a "green" — as in environmental — lawn possible.

Around the country, forward-thinking communities are testing bans on lawncare's worst aspects: forbidding loud, gas-guzzling mowers; outlawing pesticides and herbicides or requiring those who use them to post prominent signs that say so; severely limiting watering, and, in the most dramatic cases of all, making the



installation of a traditional lawn against the law altogether.

Of course, there's nothing so soft underfoot, or so nice to lie on, as a well tended lawn. On beautiful summer days, I wouldn't trade mine in for anything — even the smell of fresh-cut grass pleases me, filed as it is into my deepest memory since as far back as my first summer, I suppose.

But my lawn is smaller than it once was, and shrinking every season, in favor of groundcovers, flower and shrub gardens, and even a patch of meadow. I haven't fed it or limed it in eight years. I've also given up my images of perfection, and learned to live with some weeds. Five to ten percent weeds doesn't warrant chemical warfare, the new thinking goes, so I just mow them and enjoy their fresh green color in the crazy quilt that is my lawn. When I get up from my nap on this pleasing outdoor carpet — clover, crabgrass and all — I'll dig out a few dandelions in the name of a beautiful, but chemical-free, future.

— *Margaret Roach*

MARGARET ROACH *is the garden editor of* Newsday *and* New York Newsday *and a long-time organic gardener.*



The Purposeful Lawn

Life is too short to be spending purposeless moments mowing your lawn

BY JOHN TREXLER

I've had half a lifetime to think about lawns and their place in the home landscape. During this time I've developed both a love of a good lawn and a common-sense philosophy about its role in the home landscape: lawns are expensive both in dollars and in the time it takes to maintain them. If a lawn does not have a well defined function, it should be permitted to be field or revert back to forest. Life is too short to be spending purposeless moments mowing the lawn.

My earliest memory of lawn is not pleasurable, but rather one of the unending maintenance they entail. One Saturday morning thirty-plus years ago I sat on the grass with my father, asparagus knife in hand, carefully extracting dandelions and plantain, being careful not to leave a trace of root.

"Why is this important?" I asked my father.

"Because," was his only reply.

My suburban upbringing introduced me to thousands of lawns. They were pretty, and I regarded them without prejudice. There was one lawn that I still remember with awe: Dr. Wheeler's in Coronado, California. I was the only child permitted into his paradise. It was perfect, one hundred percent bent grass — beautiful, but now considered ecologically unsuitable for anything except perhaps a golf course. I would stand at the edge of this green carpet and stare at the lush garden beyond.

However, my early experiences with wielding an asparagus knife must have left an indelible impression. After high school I pursued an undergraduate degree in ornamental horticulture and heard countless times that "turf care" was a potentially profitable career. I chose to work in public horticulture instead.

Left: In the author's garden every patch of lawn has a purpose. Here it serves as a pathway between borders and beds.

After graduating I worked at Skylands, one of the grander examples of the golden age of American residential landscape design. While there I had the privilege of working with an old Scottish head gardener who filled my head with talk of the good old days, when caring for the 100-plus acres of lawn entailed dozens of workers crawling backwards, following a string and removing all weeds three feet on either side, then moving the string and repeating the action until all weeds were gone and the lawn was perfect. The lawns were also sponged every morning to remove dew, then powdered with fungicide to prevent disease. All for the sake of flawless lawn, lawn that served no practical function. I must admit I found this oddly romantic.

Common sense should help guide us as we develop and maintain our home landscapes. First and foremost, we need to understand that when we have acquired a home with land on which we can garden, that garden should give us pleasure — not worry, not resentment, but pleasure.

Using my own home garden in Boylston, Massachusetts, as an example, I will explain what I mean by a purposeful lawn. My small house and barn sit in the middle of a one-acre property. The driveway sits three feet south of the house, dividing the rectangular acre neatly in two. The half acre south of the driveway is half wooded and half unmowed lawn. The lawn had been mowed for many decades. I moved to the property just as the mowing season had ended, so I had the dormant season to think about the purpose of this lawn. The decision was easy, as the lawn's slope was too steep to be a useful recreational space, and too shady to be cultivated as a vegetable garden. So I decided to let it be field, with a mowed perimeter for neatness and access. The east side of the field, which borders the street, has become a screen of assorted deciduous and evergreen shrubs. This gives me privacy and spares any passersby who believe in the inviolability of manicured lawn the discomfort of witnessing this "radical" transformation.

The remaining half of my property, to the north of the house and barn, was level mowed lawn with a couple of unrelated island beds planted with assorted perennials and roses. This half acre gave me a canvas on which to create my garden. For the last five years I have methodically arranged a series of shrub and perennial borders on axes that can be viewed from various spots inside the house. The remaining grass serves as pathway through the borders and as open space for garden parties and passive lawn sports. I would guess that of the two thirds of an acre of lawn that I acquired, a sixth of an acre remains, all of which has purpose and gives pleasure.

My approach to lawn maintenance is simple. I mow it as often as necessary to maintain a consistently neat appearance. In my mind, if the lawn looks shaggy the



The amount of lawn on the property was reduced by 75 percent. Fields and flowerbeds replaced manicured turf.

whole garden looks bad. I cut the lawn to a length of three and a half to four inches. I have discovered that cutting the grass at a higher setting helps prevent weeds from getting established and conserves soil moisture during drought by shading the soil and base of the grass plant. When mowing, I catch the clippings in a bag and use them as mulch in the shrub borders. I fertilize the lawn with an organic base 10-10-10 fertilizer once every three years. I lime it with a granular limestone once every three years. I do not use herbicides. I am sometimes tempted to use a pre-emergent herbicide to prevent crabgrass from germinating. But I always forget, so every year crabgrass is part of my collection of "lawn plants."

I must conclude by saying that I really do like lawn. It is by far the simplest groundcover to maintain (as long as you have a relaxed approach). Lawn is for walking on and for playing and entertaining on. It is one of the most pragmatic elements of a garden. We just have to keep reminding ourselves of its useful function and the pleasure it should deliver.

JOHN TREXLER *is Director of the Tower Hill Botanic Garden in Boylston, Massachusetts.*

Fields and Meadows



To my thinking, fields and meadows are the most dynamic of garden habitats. They pulse with life in a way that no other garden style can. They stimulate the senses in a hundred different ways and at the same time are very relaxing because they require such simple care.

A meadow is usually defined as a grass-dominated plant community that occurs naturally in the East (as opposed to prairie, which is native to the Midwest and Great Plains states). At Tower Hill Botanic Garden in Boylston, Massachusetts, where I am director, we distinguish between fields, or open areas of herbaceous plants where the soil is basically dry, and meadows, where the soil is moister.

My lawn philosophy can be seen on a larger scale here at Tower Hill. When



Left: Daffodils bloom in the fields at Tower Hill Botanic Garden in spring.
Above: An aerial view of the Garden.



Above: A mowed path will allow you to explore your meadow garden.
Right: One of the more formal mowed lawn areas at Tower Hill Botanic Garden.

the Worcester County Horticultural Society bought Tower Hill Farm seven years ago there were approximately 30 acres of open field and 100 acres of woodland. According to the garden's master plan, 95 acres, comprising over 20 individual gardens, will be developed. Only 3-1/2 of these 95 acres will be mowed lawn. Approximately 20 acres will be field and meadow.

Our fields and meadows are managed in the simplest way imaginable. We mow these spaces once a year after a killing frost, usually in November. We occasionally have to spot-mow certain areas during the growing season.

Because one of the benefits of field and meadow is that they attract field-nesting birds, it is important to identify and not disturb them when they are nesting. We are sometimes asked why we don't hay our fields in July. Two reasons: we







The meadow garden, above left, features butterfly weed, black-eyed Susan and phlox. Center: For a more restful effect, create a meadow of mostly grasses.

don't want to disturb the nesting birds, and we don't want to disturb the natural ripening process of the seeds of early-blooming plant species. We do not seed our fields and meadows with any canned product. We let nature take its course. This has been remarkably successful. We have an extraordinary selection of species that, with a few exceptions, appeared on their own. We have introduced bulbs of Canada lily (*Lilium canadensis*), seed of fringed gentian (*Gentianopsis crinita*) and daffodil bulbs to one of the drier slopes.

Our biggest problem is poison ivy. Before we owned Tower Hill, the fields were left unmowed for a few years. During this period, birds seeded poison ivy through-



Meadows provide a succession of bloom from spring until fall. Above right: Asters and goldenrods add bold splashes of color to a meadow in autumn.

out the 30 acres. We tried controlling it by mowing biweekly, starting in August. This did not seem to work. So now, starting in June, we spot spray the larger patches with Roundup, a systemic herbicide. This is proving to be successful.

Access through the fields is via one and a half miles of mowed path. The eight-foot-wide paths expose the visitor to the delights of these habitats. Benches along the paths encourage visitors to rest and enjoy the beauty.

If you have the space on your own property, savor the pleasures of field and meadow — don't force them into submission as lawns.

— *John Trexler*



A Case for the Chemical-Free Lawn

Lawn need not be an environmental villain. Here's how to kick the chemical habit

BY WARREN SCHULTZ

The front lawn is under attack across America. It has become politically correct to bash this uniquely American institution. From the way some people talk, you'd think that those leaves of grass were responsible for the downfall of the environment, the poisoning of our water supply, the ill health of our populace, dwindling reservoirs and probably the recession, too.

Okay, so lawns don't produce bushels of vegetables and aren't the most biodiverse horticultural creations. We can attend to such things in our backyards. After all, the front lawn has been called America's great contribution to world garden design, with all those patches of unfenced grass uniting us as a democracy and as a people.

Used judiciously, lawn need not be an environmental villain. We've been hearing a lot about the value of trees for their ability to convert carbon dioxide to oxygen and so lessen the greenhouse effect. Well, every tiny grass plant does the same thing. Multiply the 30,000,000 grass plants that make up an acre of lawn by the 30,000,000 acres of lawn in America and you've got a lot of oxygen.

One of the main complaints against lawns is that they are water hogs. Not true. There's precious little evidence to show that turf uses more water than trees and shrubs. In fact, studies have shown that a six-foot-tall tree has three times the evapotranspiration rate (and therefore uses three times the water) of Bermudagrass growing beneath its canopy.

That's not to say that lawns can't be major offenders, sucking up too much water, fertilizer, herbicide, insecticide and fungicide. But home lawns can prosper without water and chemical indulgence. It's not lawns per se that are at fault. It's what we put on them.

The average American lawn is treated with five to ten pounds of pesticide per acre. And most of those chemicals are not the kind of thing you want blowing in the wind or flavoring your water.

About 40 different pesticides are commonly used on home lawns. Twelve of

them are suspected human cancer causers. Twenty-one have been shown to cause long-term health effects in lab animals or humans, including birth defects, mutations or nervous system damage.

There's no question that pesticides we put on our lawns wind up elsewhere. In the recent U.S. Environmental Protection Agency groundwater survey, Dacthal, most frequently used on lawns, was the most commonly detected pesticide in water wells. And even suburban community wells were heavily contaminated with nitrates from fertilizers. (The intake of nitrates has been linked to cancer and "blue baby syndrome.")

That's the bad news. The good news is that you don't need that stuff on your lawn. Chemicals are just short-sighted responses to problems caused by trying to grow the wrong grass in the wrong place with the wrong techniques. In fact, in some ways chemicals make it more difficult to grow a lawn. They kill off beneficial organisms in the soil that normally would keep disease organisms in check. They wipe out beneficial insects that would control harmful ones. They weaken the grass plants by causing them to grow too fast and lush. And they do absolutely nothing to solve the cause of weed problems.

So how do you grow a lawn without chemicals?

Grow the Right Grass

It all starts with the grass. Most turf problems are caused by trying to grow the wrong grass in the wrong place. But now we have more options than ever. There's been an explosion of new turfgrass cultivars over the past ten years that make getting your lawn in order an easy prospect.

If you face a problem, there's probably now a grass that can handle it. Too little rain; too much heat? Tall fescue's fast- and deep-growing roots enable it to withstand heat and drought better than all other northern grasses. Too much shade? Fine fescues thrive in relatively shady conditions. Insects bugging your patch of turf? One of the biggest breakthroughs in recent turf breeding has been the development of insect-resistant perennial ryegrasses. See page 28 for recommended grasses for your region.

Though insect resistance is a new advance in turf varieties, disease resistance is not. The disease war is pretty much over, and the grasses have won. From brown patch to fusarium to dollar spot to powdery mildew, there are new turfgrass varieties for nearly any disease you can name. The new Kentucky bluegrasses and perennial ryes offer the best package of disease resistance.



You can have a lush lawn without resorting to chemical warfare. This lawn at Colonial Williamsburg is grown organically.

Use Natural Fertilizer

Sowing the right grass will get you off to a good start, but, of course, there's more to it than that. You have to work to overcome the chemical-quick-fix mentality. Start with fertilizer. Chemical lawn fertilizers are almost always full of high-analysis, water-soluble nitrogen. They are a here-today, gone-tomorrow proposition; constant reapplication is required because they have no residual action.

The grass will be stronger and more vigorous if it's fed slowly and steadily through the season with a natural fertilizer. Most natural forms of nitrogen are water insoluble. They stick around in the ground for a long time and soil acids and microorganisms slowly convert them to forms that plants can use.

There are plenty of natural sources of nitrogen: cow manure, bloodmeal, cot-

tonseed meal, fish emulsion, leather tankage and mixed organic fertilizers. Dried poultry manure is probably the best option. One 25-pound bag of dried poultry manure will feed 1,000 square feet of lawn per year.

Don't Scalp Your Lawn

If you use natural fertilizers, your lawn doesn't grow out of control. And the lawn mower becomes a turf-management tool. Mowing is maybe the most important thing you will ever do to your lawn. Properly done, mowing can kill weeds, cure diseases, save water and provide fertilizer. By mowing high, you'll reduce stress on the grass and enable it to compete better with weeds. You'll also let the grass shade the soil to inhibit germination and growth of weeds.

Kentucky bluegrass will grow best if you cut it to three inches during the summer. Perennial ryegrass and fine fescues should be mowed a little bit shorter, 2-1/2 inches maximum, while tall fescues can be allowed to grow to four inches.

One remarkable study at the University of Rhode Island showed that high mowing alone could reduce crabgrass to virtually nothing. Left to its own devices in an unfertilized turf plot, crabgrass cover increased from year to year, reaching a high of 54 percent in the third year and dropping to 33 percent in the fifth year. But in a second plot the crabgrass cover steadily decreased from a high of 30 percent in the first year to seven percent in the fifth year. There was only one difference in the two plots: the first was mowed regularly at 1-1/4 inches, and the second was mowed regularly at 2-1/4 inches.

Invest in a Weed Popper

In general, the best defense against weeds is a healthy lawn. Thick and vigorous turf just doesn't allow much room for weeds. Of course you may have to step in from time to time to eradicate stubborn weeds. Herbicides may kill off those weeds, but they don't do anything to correct the problem. Unless those conditions — compacted soil, improper watering and mowing — are changed, the weeds will return, requiring more and more herbicides.

But you can rid a lawn of weeds without chemicals, and you don't have to spend a lot of time on your hands and knees doing it. There are several long-handled tools, weed poppers and pullers, that allow you to pull out persistent weeds, taproot and all, without much effort.

Yes, dandelions are particularly persistent. Their long taproots are hard to

pull, and root pieces left behind will regenerate into new weeds. It's important to get to them when they're at their weakest — when they're blooming, and when food reserves in the roots are at their lowest. Dig out four to five inches of the root and chances are that any remaining root pieces won't have enough strength to send up another stalk.

Know Thine Insects

Natural insect control is even easier. The first step in natural lawn insect control is learning not to overreact. Get to know the enemies so that you know both what they look like and when to expect them.

There are natural controls, both biological and physical, that wipe out every turf pest. Sabadilla dust, for example, will control chinch bugs. (So will endophyte-enhanced grass varieties; see "Building Better Grasses.") Rotenone or diatomaceous earth will take care of billbugs. And insecticidal soap or Bt will control sod webworms. Milky spore is a good long-term control measure against Japanese beetle grubs, but it takes a few years to take effect.

Topdress to Keep Down Diseases

As for diseases, they're rarely a problem with the chemical-free lawn. The soil itself can keep problems in check. In healthy soil, disease pathogens are vastly outnumbered by non-pathogenic microfauna (amoebae, nematodes and insects) and microflora (bacteria, actinomycetes and fungi). They usually have the upper hand, and keep the disease-causing organisms in check unless outside intervention, such as a fungicide or herbicide application, upsets the equilibrium.

Applications of manure can increase the disease-fighting actinomycete level in the soil. Topdressing with other organic matter such as compost, peat humus and topsoil will do the same. Applications of liquid seaweed have been shown to reduce diseases such as fusarium and dollar spot.

Finally, the secret is to stop treating your lawn as something separate from the rest of your yard. Think of it as a garden of grass. If you have weeds in your lawn, pull or chop them. If disease strikes, find out why and eliminate the cause. If insects move in, don't panic: accept some damage and then use safe biological controls if necessary.

WARREN SCHULTZ *is author of* The Chemical-Free Lawn *(Rodale Press, 1989).*

8 Steps to a Pesticide-Free Lawn

BY WARREN SCHULTZ

Going cold turkey is the best way to break your lawn's chemical habit. The sooner you remove harsh chemicals from the diet, the faster the soil will recover. And like any kind of gardening, the key to a trouble-free, sustainable lawn is a healthy soil, thriving with beneficial organisms. You may see some signs of withdrawal at first, but be patient. Here's an eight-step program for easing the transition to a chemical-free lawn.



WARREN SCHULTZ

A lawn aerator rejuvenates the soil so that worms and other soil life can thrive.

1

Aerate the turf.

Old, well worn lawns often suffer from soil compaction. This is especially the case for chemically maintained turf, because soil life is at a standstill and the soil-aerating activity of earthworms and microorganisms has slowed. Like any plant, grass suffers in compacted soil. Aerating the soil gives it a fresh start. You can buy

a hand-and-foot-powered aerator that has four hollow tines that you force into the ground, or rent a power aerator to do the job more quickly.

2

Topdress.

After aerating is an ideal time to topdress the turf. You have all those holes in your lawn; how about filling them with some vital soil or organic matter? Topdressing is a common (and frequent) practice among groundskeepers but one that remains a mystery to homeowners. It simply means covering the turf with a thin (1/8 to 1/4 inch deep) layer of sand, soil or organic matter. For the transitional lawn, it's best to resuscitate the soil with a dose of screened compost. Weed-free topsoil will also do.

3

Overseed.

If your lawn is more than ten years old then it is handicapped by old-fashioned grass. New varieties are tougher, more vigorous, better looking, drought tolerant, disease and even insect resistant. Find a blend that meets your requirements, then sow it at 1-1/2 times the recommended rate, right over your current turf. If you've just topdressed,



Above: An array of lawn weeding tools.

Below: Freshly mowed lawn.





Above: A weed popper goes to work on a pesky dandelion.



fresh soil will provide an ideal seedbed. If not, scratch the turf roughly with a metal rake before sowing.

4

Fertilize lightly with natural turf food.

Natural fertilizer such as chicken manure or compost-based turf food can add essential disease-fighting microorganisms (such as actinomycetes) as well as all the NPK (nitrogen/phosphorus/potassium, the major components of fertilizer) and micronutrients necessary. Twenty five pounds of chicken manure per 1,000 square feet of lawn, once a year should be all that's necessary.

5

Mow high, mow often, leave the clippings.

As they break down on the soil, grass clippings can contribute more than one pound of useable nitrogen per 1,000 square feet. Clippings will begin to break down within one week if the soil is alive with organisms. The breakdown will be slower in a system with a chemical history. In that situation, the smaller the clippings the better. So mow lightly and often or use a mulching mower.

6

Monitor your lawn.

Take the time to get to know your turf. Look for insects at ground level, or pull back patches of sod to look for grubs underneath. If you find brown or dying patches, before treating for disease, consider environmental causes such as improper drainage, gasoline or pesticide spills, soil compaction or dog damage.

7

Use biological controls only as necessary.

Your lawn does not need to be a bug-free zone. Take action against pests only if damage is evident and obvious. Then use the most selective, least harmful pesticide available for the job.

8

Consider grass substitutes.

Most disease and weed problems occur where conditions are not conducive to good grass growth. Think about substitutes in those situations, such as ground covers in shady spots or bark or gravel in pathways or heavily trafficked areas.



Above: Out comes the dandelion, taproot and all.



Turf Tips

RECOMMENDED GRASSES FOR EVERY REGION

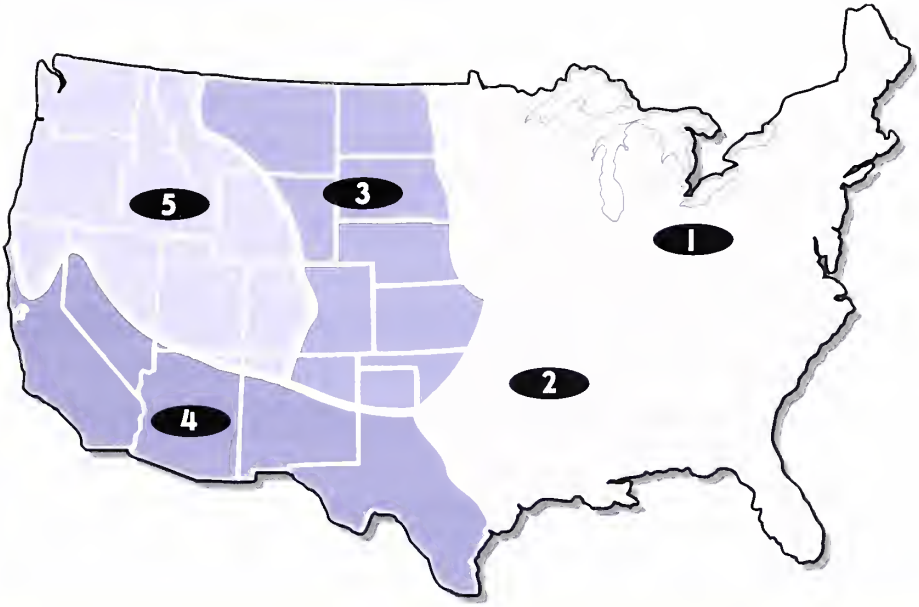
ZONE ONE	NORTHEAST AND UPPER MIDWEST
Kentucky Bluegrass	Midnight, Liberty, America, Blacksburg
Perennial Ryegrass	Yorktown II, Palmer, Repell, Pennfine
Tall Fescue	Mustang, Silverado, Rebel II, Olympic
Fine Fescue	Spartan, Reliant, Atlanta
Zoysia	Midwestern

ZONE TWO	SOUTH
Bahiagrass	Paraguay, Pensacola, Argentine
Bermudagrass	Tifgreen, Tifway, Vamont
Zoysia	Meyer, Emerald
Centipedegrass	Oaklawn, Tennessee Hardy
St. Augustinegrass	Roselawn, Better Blue, Floratine
Fine Fescue	Spartan, Reliant, Aurora

ZONE THREE	PLAINS
Buffalograss	Texoka, Prairie, Sharp's Improved
Kentucky Bluegrass	America, Dawn, Harmony
Tall Fescue	Apache, Rebel, Clemfine
Fine Fescue	Reliant, Aurora
Perennial Ryegrass	Blazer, Palmer, Yorktown II
Bermudagrass	Tifway, Tifgreen

GRASS ZONES OF THE UNITED STATES

The United States is divided into five grass zones: the humid Northeast (zone 1), the humid South (zone 2), the Plains (zone 3), the arid Southwest (zone 4) and the humid Northwest (zone 5).



ZONE FOUR	SOUTHWEST
Buffalograss	Texoka, Prairie, Sharp's Improved
Bermudagrass	Tifway II, Tifgreen, Midirion
Tall Fescue	Arid, Apache, Mustang
Perennial Ryegrass	Palmer, Citation II, Tara
Kentucky Bluegrass	Classic, Glade, Trenton
Fine Fescue	Waldina, Scaldis
Zoysia	

ZONE FIVE	NORTHWEST
Kentucky Bluegrass	Blacksburg, Challenger, Midnight
Bentgrass	Exeter, Putter, Prominent
Tall Fescue	Falcon, Houndog, Mustang
Fine Fescue	Reliant, Scaldis, Enjoy
Perennial Ryegrass	Palmer, Manhattan II, Repell

THE LAZY GARDENER'S GUIDE TO FERTILIZING LAWN

When to fertilize, and how much, depends on where you live and the kind of grass you're growing. Remember, the more you fertilize, the more your grass will grow and the more you'll have to mow. The following is a minimal maintenance schedule for all five grass zones. Recommendations are in actual pounds of nitrogen per 1,000 square feet. To calculate the number of pounds of nitrogen in, say a 40-pound bag of 10-3-4 fertilizer, multiply 40 (what the bag weighs) by 10 percent (the percentage of nitrogen, represented by the first number of the nitrogen-phosphorus-potassium ratio on the fertilizer bag). In other words, there are 4 pounds of nitrogen.

ZONE 1 THE HUMID NORTHEAST

Two pounds in September or October or after grass stops growing

ZONE 2 THE HUMID SOUTH

For Summer Grasses*

One pound in June, one pound in August

For Winter Grasses*

Two pounds in September or October

ZONE 3 THE PLAINS

Two pounds in September

ZONE 4 THE ARID SOUTHWEST

For Summer Grasses, Cool-Season Species*, Irrigated

1-1/2 pounds in October or November, 1-1/2 in May or June

For Summer Grasses, Warm-Season Species*, Irrigated

1/2 pound every month, May to August

For Summer Grasses, Warm-Season Species, Non-Irrigated

One pound in April or May, one pound August

For Winter Grasses, Cool-Season Species

Two pounds in October or November

ZONE 5 THE HUMID NORTHWEST

Two pounds in October or November or after the grass stops growing

* In southern regions, warm-season species such as Bermudagrass or Bahiagrass are the summer grasses of choice. They are sometimes overseeded in fall with a cool season species such as Kentucky bluegrass or ryegrass that provides winter green after the summer grass has gone dormant.

HOW LOW SHOULD YOU MOW?

Mowing is probably the most important thing you do to your lawn. Most people mow much too low. Mowing high is the key to a healthy lawn. Here are the best mowing heights in inches, by species. As indicated, the mower deck should be raised in hot weather or shade, and lowered somewhat for the last mow before winter.

Cool-Season Grasses	Cool Weather and/or Shade	Hot Weather	Last Mow
Bentgrass	1/3	2/3	1/3
Kentucky bluegrass	2-1/2	3	2
Fine fescue	1-1/2	2-1/2	1
Tall fescue	2-1/2	4	2
Perennial ryegrass	1-1/2	2-1/2	1

Warm-Season Grasses	Cool Weather and/or Shade	Hot Weather	Last Mow
Bahiagrass	2	3	1-1/2
Bermudagrass	1/2	1	1/2
Buffalograss	1-1/2	2-1/2	1
Centipedegrass	1	2	1
St. Augustinegrass	2	3	1-1/2
Zoysia	1/2	1	1/2

Adapted from The Chemical Free Lawn *by Warren Schultz (Rodale Press, 1989)*

Building Better Grass Seeds

Growing a lawn from the new breeds of seed makes being an organic gardener a whole lot easier

BY MARIE POMPEI

The turfgrass industry has come a long way. Just a few decades ago, grass selection for a handsome lawn pretty much began and ended with Kentucky bluegrass in the North and Bermudagrass in the South. These lawns would do well only if they were lavished with fertilizer, water and pesticides.

The alternatives also left a lot to be desired. Perennial ryegrasses were coarse and unattractive, difficult to mow and short lived. Tall fescues were so coarse-looking that they were used strictly for forage or on steep banks where their strong, deep roots helped control erosion. The bristle-like fine fescues were considered to be "the shade grass" and used only as a component of shade mixtures.

But today, when you look for grass seed you can choose from scores of improved varieties that have a pleasing dark green color, finer texture and disease and insect resistance without so much chemical help. They also have better mowability, meaning that you get a cleaner cut, without shredding the leaf.

Grass Bugs Refuse to Eat

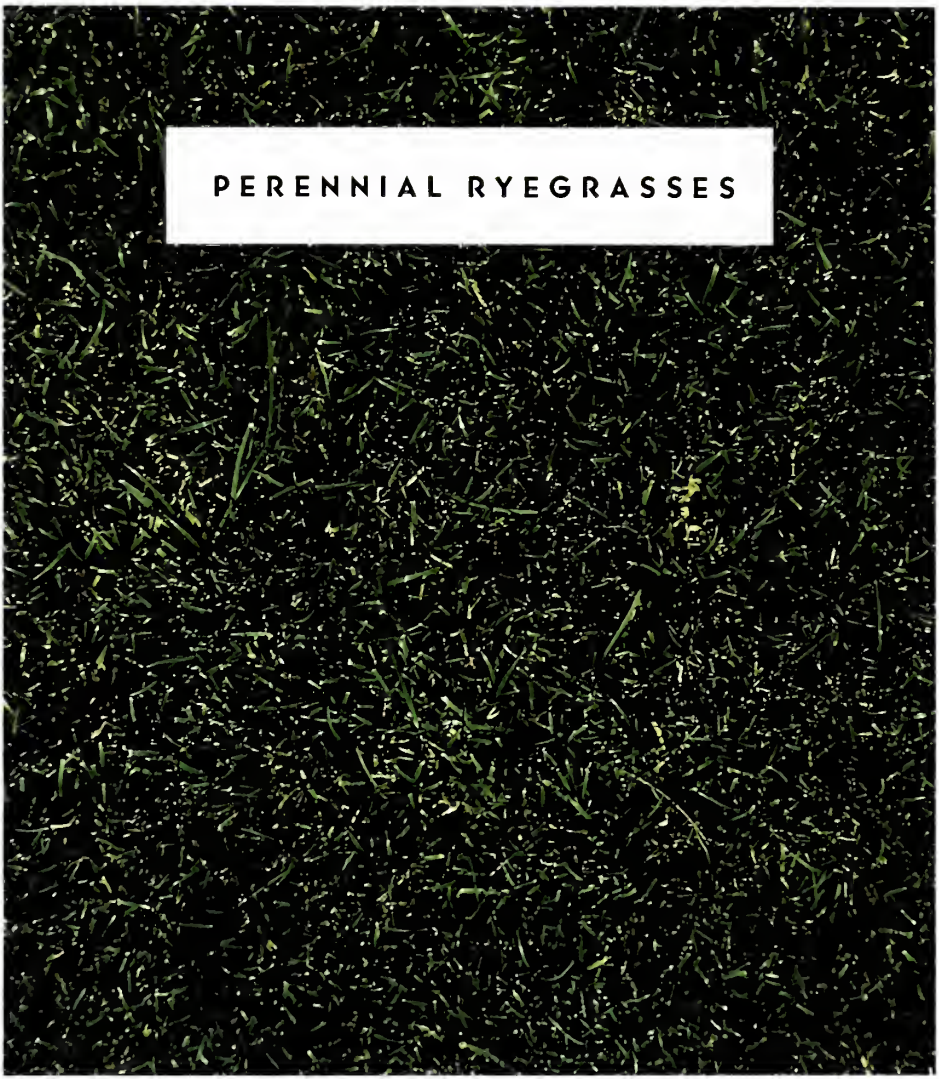
One of the most dramatic developments has been the introduction of new, insect-resistant lawngrasses. For example, perennial ryegrass varieties such as Palmer II, Repell II and Citation II have improved insect resistance thanks to a naturally occurring fungus found in the plant called an endophyte. The plant is inoculated with endophyte, which becomes concentrated in the stem and crown portion. The fungus is most effective in repelling insects that feed on these areas of the plant, including aphids, armyworms, billbugs, chinch bugs and sod webworms. Endophytes are transmitted by seed only; they don't spread from plant to plant in the field. And because endophytes are a living fungus, they will die after one year if the seed is not stored properly. When purchasing endophyte-enhanced seed, look for seed labeled for that year and store unused portions in a cool (40 degrees F is ideal), dry spot out of direct sunlight.

Species other than perennial ryegrass also have endophyte-enhanced varieties. Turf-type tall fescues such as Titan, Shenandoah, Tribute and Mesa contain the fungus, as do the fine fescue varieties Jamestown II Chewings fescue, Reliant hard fescue and Warwick. There are no known varieties of Kentucky bluegrass or creeping bentgrass that are endophyte enhanced; however, research is ongoing in this area.

Studies have also shown that endophyte-enhanced varieties are more tolerant of heat and drought. Researchers are currently looking at a link between endophytes and disease incidence as well.

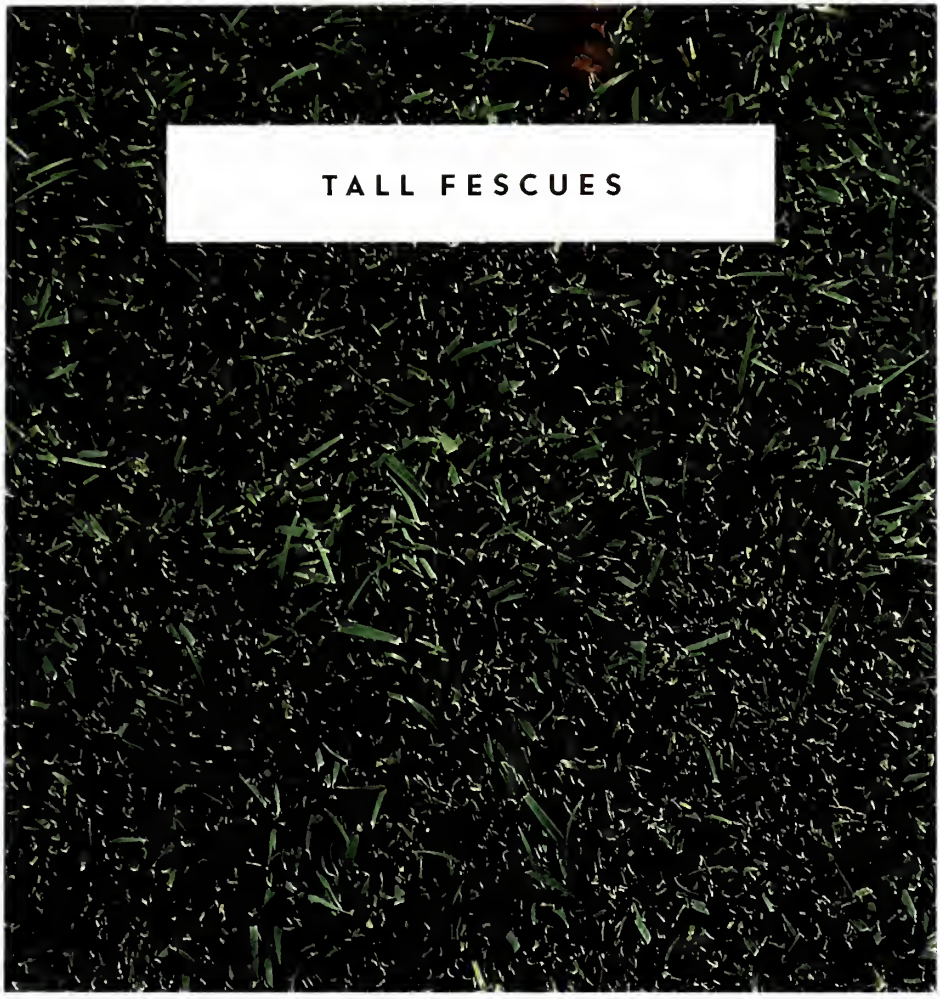
Weed Alert

Some of the grasses mentioned in this article grow so readily that they have become pernicious pests in natural areas, crowding out native species. John Randall, "weed czar" of the Nature Conservancy, which operates scores of nature preserves across the country, reports that tall fescue is extremely invasive in moist areas of the West, particularly east Texas and Oklahoma, Arkansas, Idaho, Oregon and Ohio. Kentucky bluegrass (native to North Africa and Eurasia, not the Bluegrass State) is a problem in the Midwest; perennial ryes in California. If you live near a natural area, be sure to consult the park or preserve manager about invasive grasses and other plants you should avoid growing in your garden.



Breeders have not only made the perennial ryegrasses unpalatable to insects, but they've also greatly improved their color and general appearance. The color of newly released Palmer II, Prelude II, Yorktown III and Repell II is dark and very attractive. That means less fertilizer will have to be applied to these varieties during the year to maintain a pleasing color.

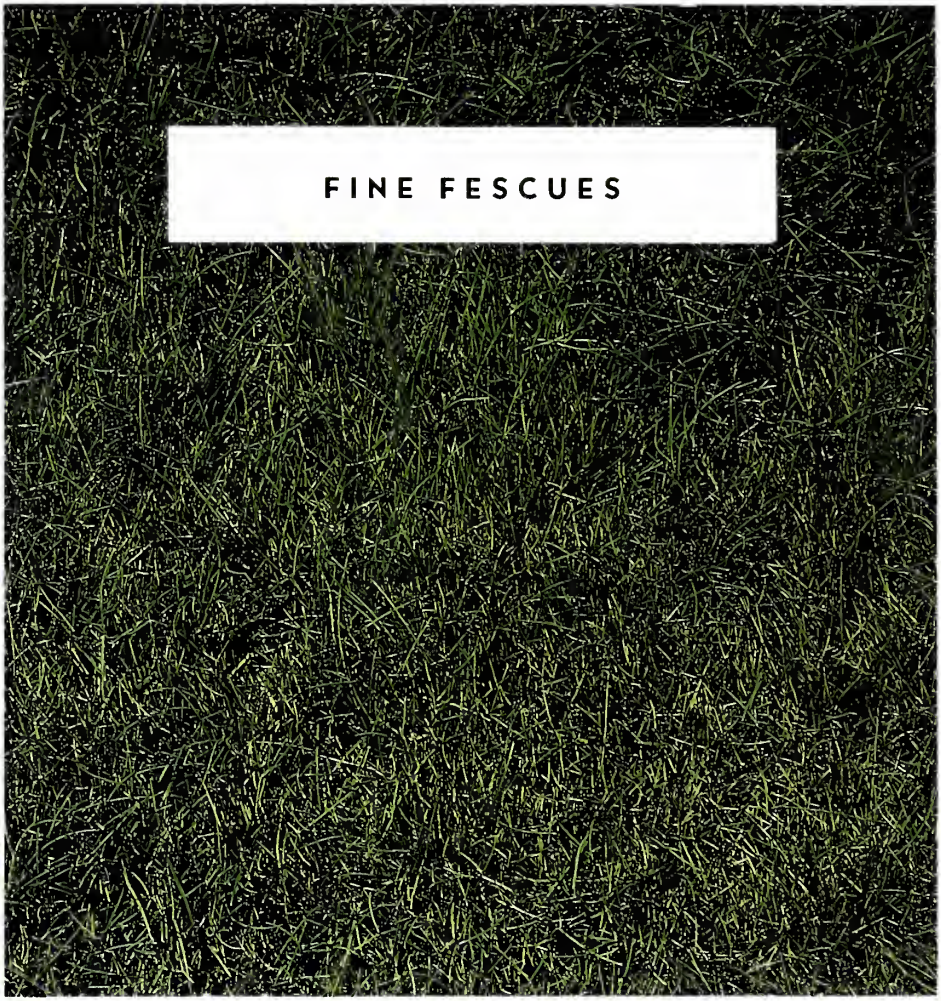
Finer texture and improved mowability are other pluses of these varieties, and they're much quicker to become established. Their slower and lower growth means you spend less time behind the mower and generate fewer clippings that need to be disposed of.



TALL FESCUES

Kentucky 31-type tall fescues were the only game in town until 1980 when Rebel hit the market. Since then there has been an explosion of new turf-type tall fescue varieties — over 60 in all. These new improved cultivars not only are heat and drought tolerant but they also have a finer texture and darker green color than Kentucky 31.

Tall fescues are supremely useful in the landscape as they are adapted to both shady and sunny locations and tolerate a wide range of soil conditions. They're generally tough grasses and extremely wear tolerant once established. Furthermore, they need less nitrogen than Kentucky bluegrass or perennial ryegrass. And, as already mentioned, some varieties are endophyte enhanced for improved insect resistance.



FINE FESCUES

The fine fescues, including Chewings fescue, hard fescue, creeping red fescue and sheep fescue, are finally receiving their due. Known for years for their shade tolerance, these attractive, fine-textured grasses are also increasingly being hailed for their low-maintenance requirements. They reach a mature height of only 12 to 18 inches, don't like a lot of fertilizer and tolerate droughty soil. They work well on slopes or any area that is difficult to mow and maintain. When left unmown, fine fescues do well in sun or shade. If you prefer a more controlled look, only two mowings are needed per year: one in mid to late June and again in late September, both to a height of 4 inches. Varieties to look for include Jamestown II Chewings fescue, Reliant hard fescue, Warwick and SR5000 Chewings fescue. Many of these varieties are enhanced with endophytes for insect resistance.



Kentucky bluegrass is still the king of turfgrasses for many homeowners and landscapers, thanks to its fine-textured, deep green blades and its ability to spread quickly to form a dense sod. Yet not all varieties of Kentucky bluegrass are easy to maintain. Fortunately, many new lower-maintenance varieties that require less moisture and fertilizer are now available, including Midnight, Ram I, Merit and Baron.

When it's time to reseed or renovate your lawn, be sure to look for a mix that includes these new, improved varieties — or mix your own, using the grasses best suited to the conditions in your yard.

MARIE POMPEI, *a research agronomist with Lofts Seed, Inc., is involved in all phases of turfgrass research, including the coordination of university testing of new varieties introduced by the company.*

How to Renovate Your Lawn

What to do when it's time to start over

BY MARIA T CINQUE

The best time to completely renovate a lawn is when temperatures are cool and rain is plentiful. In the Northeast, this is between mid-August and the end of September; in this part of the country, late-summer seeding is preferable to springtime seeding because it is generally warmer and the new grass has almost a whole year to grow before it is subject to summer heat and drought. What's more, there's far less competition from weeds.

Get Rid of the Existing Grass

The first order of business is to remove all the existing turf. Dig up the grass or till it under. Rake up and remove the clumps. Be sure to dig deeply enough to remove the entire root of persistent, deep-rooted weeds like dandelions. If the existing lawn is full of hard-to-kill perennial weeds like quack grass you can spray a non-selective herbicide on the old lawn. This will eliminate not only the weeds but any existing grass. Consult your local Cooperative Extension office for the name of the safest one to use. Keep in mind that a non-selective herbicide by definition will kill most plants it comes in contact with, so if there is anything you don't want to eliminate, don't allow the spray to get on it. Don't spray in the wind or rain and read and follow the instructions and precautions on the label. After the grass is dead rake it up.



The best time to renovate your lawn is when temperatures are cool and rain is plentiful. In this case, simple spot seeding should do the trick. Use a heavy metal rake to remove the thatch and clippings and expose the soil.

Add Organic Matter, Lime and Fertilizer

Adequate soil drainage is a prerequisite to having a healthy lawn. Water shouldn't puddle up after a rainfall. Conversely, very sandy soils often drain too fast and your grass will easily become stressed from lack of moisture. You can remedy both kinds of drainage problems by adding organic matter to your existing soil. Unless the problem is severe, a 4- to 6-inch layer of compost or peat moss mixed into the top 8 to 10 inches of soil should help to alleviate most drainage difficulties. Compost has advantages over peat moss: it is usually readily available at little or no cost from recycling centers, or you can buy it at the local garden center. Many people have their own composting bins which serve not only as a source of organic matter but also as a way to recycle garden trimmings.

Even if you don't have severe drainage problems, your soil may need some organic matter. You can tell by its appearance. If it is very sandy or very clayey,



One way to get rid of your old lawn is to cover it with plastic until all of the grass is dead.

chances are the organic content is not good enough. If there's time, have your soil tested to determine the level of organic matter.

If possible, establish a soil grade that slopes slightly away from the house or other buildings. Avoid steep slopes because they are difficult to establish and mow. When regrading, keep in mind that soil added on top of tree or shrub roots can cause injury to the plants.

Lawn grasses prefer the soil pH in the 6.5 to 7.0 range. This is very important because essential turfgrass nutrients are most available to the grass at this pH. Inexpensive soil pH test kits are available at most nurseries. If the soil pH is below 6.5, add lime to bring it up to the proper level.

Seed sown on unfertilized soils usually produces a thin and unhealthy turf. While you're adding lime and organic matter, incorporate the proper amount of a complete fertilizer into the top 6 to 8 inches of your soil. Use a fertilizer with plenty of phosphorus. (Phosphorus is the middle number on the fertilizer bag.)



The same lawn after renovation. A stone wall and shrubs have eliminated a hard-to-mow slope.

Because phosphorus moves very slowly in the soil, it must be mixed into the soil to be effective, not just sprinkled on top.

Mix the organic matter, lime and fertilizer into the soil by rototilling or spading. You can rent a rototiller or hire a landscape gardener to do this.

A level seedbed is an absolute must. Rake the entire area with a wide wooden or aluminum rake. It's a good idea to allow a few days for the ground to settle before the final raking so that high and low spots can be eliminated.

Before you seed, add another light application of fertilizer to make sure there is adequate fertilizer near the germinating seed.

Sow the Seed

If you're preparing your own seed mix, make sure that all the varieties of grasses are evenly distributed throughout the mixture. For this reason, it's usually best to buy a commercial seed blend that has been mixed by the manufacturer.



A level seedbed is an absolute must. Rake the entire area with a wide wooden or aluminum rake. Seed, then rake again lightly – just enough to cover the seed with 1/8 inch of soil.

Divide the grass seed in half and sow half the mixture in one direction and the other half at right angles to it.

Lightly rake the seedbed just enough to cover the seeds with about 1/8 inch of soil. Don't rake too deeply — if the seeds are covered with too much soil, they may not germinate.

You may want to consider rolling the seedbed with a light roller to firm the soil and promote better seed-soil contact, which in turn will promote better seed germination. Deleting this step will not harm the seed, but it may germinate a little more slowly.

Water is critical when you're getting your new stand of grass established, even if the grass is a drought-tolerant type. Don't overwater or the seeds may wash away. Water lightly but enough so that the top few inches of soil are moist. After this initial watering, water lightly several times a day, especially on

hot, windy days. Try not to walk over the newly seeded area. As soon as the grass is three inches high, mow it. Your new lawn should be mowed regularly from then on.

MARIA T. CINQUE *is a turfgrass specialist and coordinator of turfgrass research for Cornell Cooperative Extension on Long Island, New York.*

SPOT SEEDING

If your lawn has a few bare spots, your task is a lot easier. Mow the lawn very closely, then use a heavy metal rake to remove thatch and clippings and expose the soil. With a hoe or spade, remove major weeds. Selective herbicides (herbicides that kill only specific types of weeds) can be used for weed control, but you'll have to wait at least a month to seed the bare spots after making the application; consult your local Cooperative Extension office about which herbicide to use.

Seed, rake lightly, topdress with a thin layer of compost or soil and water well.



Buffalograss



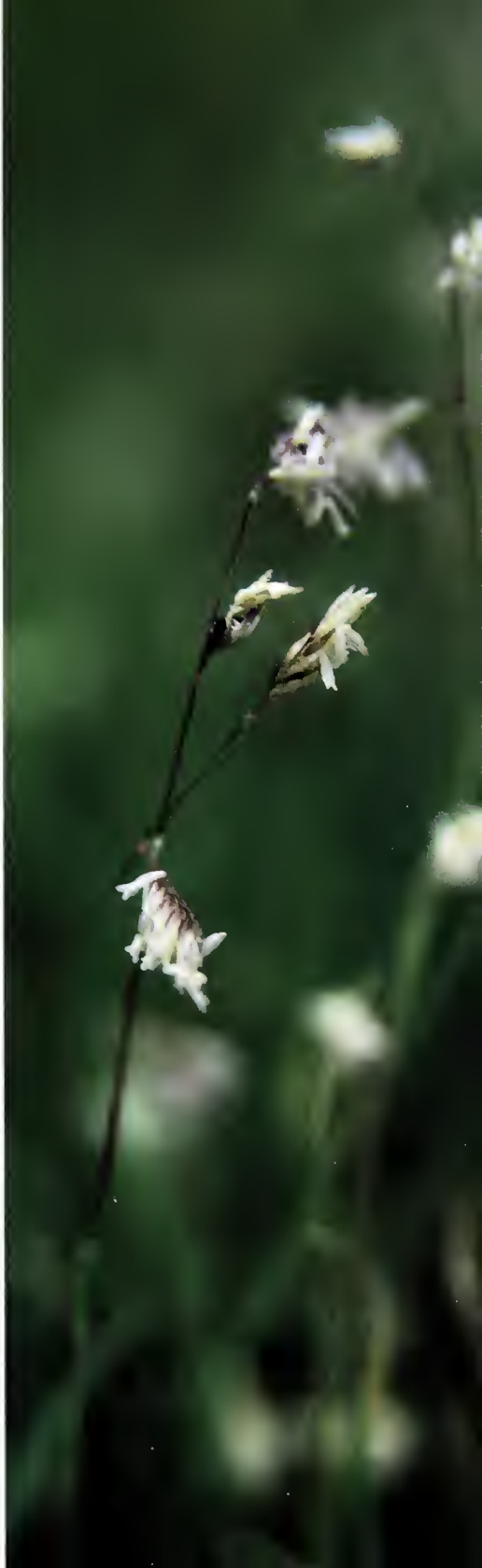
The greatest contribution to weekend leisure time since the invention of remote-control TV

BY SALLY WASOWSKI

WITH ANDY WASOWSKI

Just when I thought I was inured to reading shocking revelations about celebrities, I came upon this tidbit in my local paper. It seems that actor Richard Widmark was quoted in *Architectural Digest* as admitting to "a passion for cutting grass." He not only mows his own 40-acre Connecticut estate, he then tackles the lawns of his neighbors. He claims to find this ... "very satisfying."

No wonder this made the papers. All the people I know who enjoy mowing their lawns could fit into my car, and



Left: Female buffalograss showing non-pollen producing flower. Right: Male buffalograss showing prominent pollen-producing flower. Female is best for a consistent green lawn.



Prairie buffalograss lawn on right; Bermuda on left. The Bermudagrass received over 30 waterings that year; the buffalograss only two.

still leave room for three suitcases, two stereo speakers and an 8-gallon ice-chest.

Which is why, someday, there may well be a movement to canonize Drs. M. C. Engelke and Terry Riordan, and Virginia Lehman.

These three people are responsible for perhaps the greatest contribution to weekend leisure time since the invention of remote control TV. They have been pioneers in the development of a lawn that can be mowed as few as one to four times a year and still look impeccable. This miracle lawn is composed of new varieties of a native American plant called buffalograss *(Buchloe dactyloides)* that grow to a maximum of only 4 to 6 inches — and then stop!

The new buffalograsses are fine-textured, extremely heat- and cold-resistant and drought-tolerant, and require minimal fertilization and pesticide control. They spread quickly and green up earlier in the spring than St. Augustine or Bermuda. Female varieties offer an additional bonus for hayfever sufferers; because they lack the distinctive male flowers found on other strains of buffalograss, there is no pollen. To keep them all-female, best for a consistent green lawn, the grasses must be planted by sprigs, plugs or sod, instead of seed.

Dr. Engelke, at the Texas A&M Experiment Station in Dallas, and his student, Virginia Lehman, were responsible for one of the earliest buffalograsses, 'Prairie', which posseses a soft "apple green" color. Dr. Riordan, working at the



The same lawns, showing winter colors – the buffalograss has a softer, more golden hue.

University of Nebraska, developed '609', which hit the market a few months after 'Prairie', and is touted as having a somewhat darker, blue-green color and a denser mat. Both turf grasses instantly found an enthusiastic market.

Interest in buffalograss for lawns developed among water-conscious homeowners in the Southwest at least ten years ago. Aside from its drought tolerance, wild buffalograss is as close to a natural lawn as anything I have ever seen; it is genetically low-growing.

But back then, the only kinds available to buy were tall and had to be planted from seed. The most commonly used varieties were 'Texoca' and 'Sharp's Improved'; both were bred for use in pastures and grow to about a foot high.

Buffalograss is native throughout the Great Plains, from Minnesota to Montana and south into Mexico — growing wherever conditions aren't too moist, too dry (deep sand) or too shady. It takes extreme cold (minus 30 degrees F) and lots of heat (plus 120 degrees F). It is a warm-season grass that tends to be green from early spring to late fall. But it can turn golden brown, that is, go dormant and send all its juices down to its roots for safekeeping, whenever it needs to protect itself from either extreme drought or extreme cold.

Buffalograss has a fine, soft, even texture that invites bare feet. At the same time, it takes a lot of foot traffic without complaining. It covers quickly, outlives



This buffalograss lawn, sown by broadcasting the seed, is barely a year old. The bed of native wildflowers includes winecups and red yucca.

standard turf grasses, needs less fertilizer to remain dense and forms such a tight sod that weeds can't get a root in edgewise. Another nice thing — it is not at all attracted to the rich, moist environment of your flowerbed, where it is not wanted.

In fact, there is only one thing that can make a buffalograss lawn look bad, and that is *too much water*. Buffalograss's worst enemy is the well-meaning homeowner or groundskeeper who insists on treating it like conventional grass — by drowning it.

No wonder water departments all over the country are enthusiastic fans of buffalograss; it fits in perfectly with the new xeriscape (low water-use) concept of landscaping that many of them are promoting.

Buffalograss needs 25 to 30 percent less water than common Bermuda, approximately 80 percent less than hybrid Bermuda, 75 percent less than Kentucky bluegrass and 50 to 80 percent less than St. Augustine. Dr. David Northington, Director of the National Wildflower Research Center in Austin, Texas, tells the story of when he went off on vacation one year and didn't water his buffalograss lawn at all during July and August. When he returned home, his lawn was greener than his neighbor's Bermuda lawn, which had been watered twice a week.

Because it needs little or no water, little or no fertilizer and little mowing, a buffalograss lawn is a cinch to maintain. Its primary requirement is lots of sun-

light, making it ideal for golf courses, schools, parks, dams, roadsides, public buildings and suburban corporate headquarters — and, of course, residences that aren't covered up by shade trees.

Buffalograss support, not surprisingly, comes mostly from its own native territory — the West and Midwest — where it provides folks with the low-maintenance lawn they've always wanted but until now didn't believe was possible. But interest in buffalograss is spreading beyond its native range, with some of the newer varieties being tested and used throughout much of the United States.

In Los Alamitos, California, 'Prairie' buffalograss is credited with making the Cypress Golf Course possible. Tom Buzbee, with Kajima Engineering and Construction, Inc., says that the course had only 100 acres available to work with — much less than on the average golf course. Fitting in all eighteen holes while keeping golfers from killing each other with misdirected slices and hooks called for a creative display of earth-moving and mound-building, effectively protecting one fairway from the others without resorting to unsightly, artificial fences and screens.

The result was a series of precipitous slopes that were a maintenance crew's nightmare. The buffalograss was installed and mowing was reduced to just once every five to six weeks. Common Bermuda must be mowed once every five days! And don't forget the umpteen million gallons of water that will be saved over the lifetime of the course.

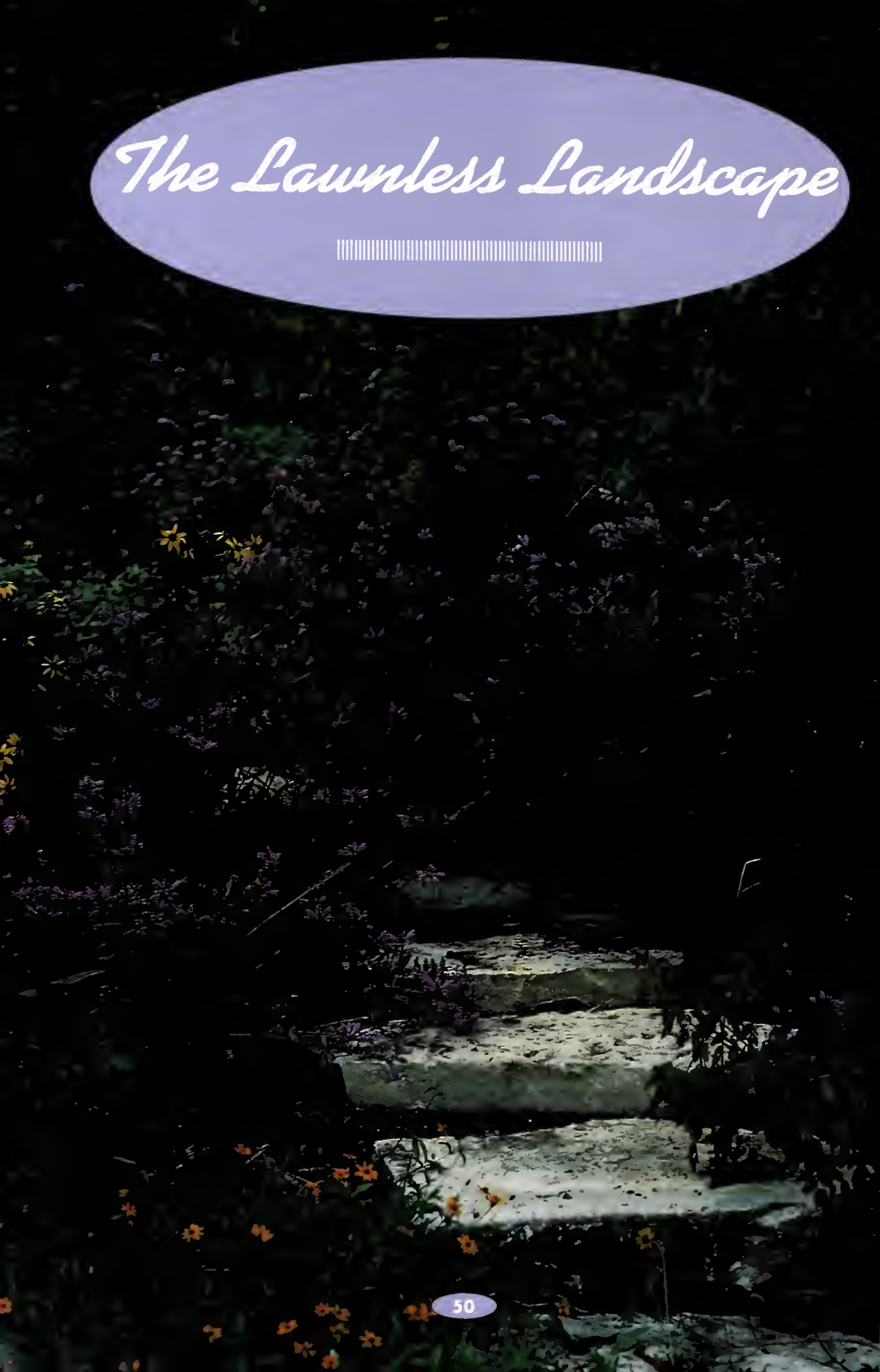
Dr. David Huff, assistant professor of plant genetics at Rutgers University in New Jersey, gives buffalograss a qualified thumbs up for the Northeast, and says it does well in dry, compacted, heavy soils. According to Huff, there is great interest in using buffalograss along both the New Jersey Turnpike and the Garden State Parkway, on steep, unmowable slopes.

Dr. Huff is also working on a short-leaved buffalograss from Mexico, a diploid that should deliver still greater density — and an all-male short turf variety that comes with different colored anthers (the parts of the flower in which pollen is produced); he already has red, white and blue separated. Imagine that growing in the front lawn of the White House!

As for Mr. Widmark ... well, I don't think he'll be ordering any for his home in the near future.

SALLY WASOWSKI *is a Dallas-based landscape designer and author. Her latest book, coauthored with her husband,* ANDY WASOWSKI, *a free-lance writer and photographer, is* Requiem for a Lawnmower *(Taylor Publishing).*

The Lawnless Landscape



How to stand tall and throw off the yoke of turfgrass tyranny — and remain friends with your neighbors

BY SALLY WASOWSKI

WITH ANDY WASOWSKI

A few years back, Sara Lowen wrote a wonderful article for *American Heritage* magazine which addressed our seemingly slavish devotion to surrounding our homes with carpets of turf grass. She called her piece, "The Tyranny of the Lawn." In fact, the title could just as easily have been, "The Tyranny of the Neighbors."

Worrying about what the neighbors will think is basic to being *homo sapiens*, like walking erect and paying taxes. Remember back in high school? Getting the approval of our peers was more important than food.

Today, we're sophisticated, logical adults, but we still insist on spending an inordinate amount of time pushing a lawnmower around our property (or paying out good money to have some kid do it). Worse, we coddle our grass — annointing it with oceans of water and toxic chemicals. If the grass is always greener in the other guy's yard ... it drives us absolutely nuts!

If we happen to live in a part of the country that has periodic, even chronic, water shortages (and that means most of us), we see nothing wrong with running our sprinkler systems full blast, even at high noon during the summer's worst heat. Andy and I have driven through neighborhoods in the southwestern deserts, where rainfall is measured in fractions of an inch, and seen the kind of lush lawns one expects to find in, say, Virginia or New England.

Left: The authors' home, the August after they got rid of the last of their lawn. This environmentally friendly landscape uses little water, no chemicals and requires only a few days per year of maintenance. Wildflowers spill onto a limestone path.

Aside from the unconscionable waste of precious water, these landscapes have no "sense of place." They contribute to the homogenizing of America, where a neighborhood in Ohio looks pretty much like a neighborhood in Georgia or California. We seem, also, to be losing a sense of time; our dependence on evergreenery, including turf grasses, such as winter rye, gives many of our landscapes a mind-numbing, uni-seasonal appearance.



VIOLA MISSOURIENSIS, Missouri violet

And why? Because we don't want our neighbors to think ill of us. As humorist Dave Berry so pointedly put it, "In America, having a nice lawn is considered a major cultural achievement, like owning a hardcover book or watching 'Meet the Press.' The average American would rather live next door to a pervert-heroin addict-Communist-pornographer than someone with an unkempt lawn."

But while this typical landscape of lawn, evergreen boxhedge and some trash trees may be neat, it's also boring. Worse, it's a lot of work! In fact, I've formulated an axiom, based on years of personal observation: "The more boring the landscape, the greater the need for upkeep and maintenance." Check me out on that.

If you are nodding agreement as you read this, yet you are still maintaining such a landscape, then it's time for you to stand tall and throw off the yoke of turfgrass tyranny. It's time for you to convert your landscape to a more natural-looking, low-maintenance, environmentally friendly scene.

Does this mean you should totally disregard your neighbors' feelings? Not at all. It's important to maintain good relations; you never know when you'll need to drop over and borrow a cup of sugar or an extension cord or something. Therefore, unless you are unusually courageous, start off subtly. We did, and most of our neighbors are not only still talking to us, but a few have actually started imitating us.



PHLOX PILOSA, fragrant phlox

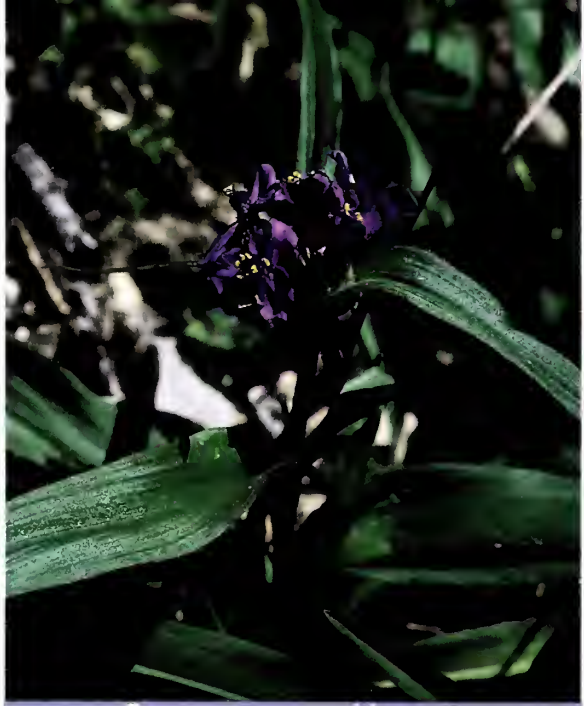
When we first moved into our present home fifteen years ago, the front yard was just another conventional landscape. But that was okay — we were still fairly conventional in those days, too. The lawn was St. Augustine, an especially bad choice for most of the Southwest because it doesn't just drink water; it guzzles it. So, naturally, we did what the neighbors had done — we put in a sprinkler system.

In those days, I was still a lay gardener — and a blackthumb one at that. The reason I'd loved wildflowers all my life was because they survived my care better than anything else.

Soon after moving in, I began hearing how some people were using native ornamental trees and shrubs in the landscape instead of the same old standard nursery stock. These natives, it was rumored, required far less coddling; after all, they had survived in these parts for millenia with no help from anyone. These sounded like my kind of plants.

About this time, too, I was beginning to play around with landscape designs — for myself at first, then for a few family members and friends. Incredibly, one day my cousin Jenny offered to pay me for a plan. I was off and running in a new career.

And because I had decided to specialize in natives, I needed an experimental garden where I could try out plants before recommending them to my trusting clients. The front of our property, along the street, was so designated.



TRADESCANTIA SP., spiderwort

Back then, just finding native plants was a chore! Your average nursery was as ignorant of native plants as were their customers. I did a lot of seed collecting in vacant lots, and saved a few plants that would otherwise have been bulldozed under. And, in some instances, I drove down to Austin, home of one of the very few nurseries that actually specialized in natives at that time.

Each new addition to my garden was carefully hand-watered, giving it just enough the first year to get it established. After that, watering was minimal, and then only to bring out the best the plants had to offer. I not only wanted them to look better than they do in the wild; I wanted them to look gorgeous; I wanted them to wow my neighbors.

The St. Augustine lawn, by the way, got just as little water as the native garden, and we expected to see it dry up and die. It didn't. Partly because it was in a semi-shady area, partly because it had been so well established and partly, I think, just to spite me and my new gardening ideas, it hung in there year after year.

But it was the native garden that was the focus of my landscape; and I was delighted when passing joggers would pant a compliment about the colorful seasonal displays. Of course, in the back of my mind, one nagging question still lurked — was my experimental garden acceptable to the neighbors only because I still maintained a lawn — albeit a small one? Was it possible that this grassy patch made all my native planting "tolerable?"

If so, I would soon put them to a real test.

In my design business, many of my customers were people who had purchased undeveloped land out beyond the suburbs — land that had not yet been scraped clean by a bulldozer. Here, I was able to design truly natural landscapes, building on the wonderful raw materials Mother Nature had placed there. The



RUELLIA SP., ruellia

concept was simple: the house should look like it had been gently set down into the landscape. The hand of the designer should be seen only in a subtle way.

I loved this natural look, and began to wonder why it couldn't be re-created on established landscapes, such as my own. Would it be possible to undo that "civilized," over-controlled look that so many of us were living with? My husband and I decided to find out. We would eliminate that lawn altogether. Our front yard would display not one blade of conventional turfgrass. Instead, it would be designed with a palette of plants that would make it look like a natural woodland.

Now, the purist in me wanted to rip out everything that was not indigenous to Dallas. I would have loved the challenge of re-creating an authentic Dallas woods, such as might have originally been on the creek bank that our lot once was.

What seemed more sensible for my garden was to build on what I already had — and that included many non-native plants that I had inherited along with the deed. Whatever could survive my watering regimen and lack of pampering, I figured, had earned the right to stay. All except the lawn, that is! That got plowed under. Then I added three native flowering understory trees — an Eve's necklace *(Sophora affinis)*, a rusty blackhaw viburnum *(Viburnum rufidulum)* and a Mexican buckeye *(Ungnadia speciosa)* — and created a knee-high groundcover of native and near-native plants — horseherb *(Calyptocarpus vialis)*, avens *(Geum*

canadense), Turk's cap *(Malvaviscus arboreus* var. *drummondii)* and a polite but unidentified sedge - most of which were already here in abundance and only needed to be divided and transplanted.

Winding up from the street to the front gate is a walkway of limestone slabs. A second limestone path crosses at the top, coming from the neighbor's yard, and meets the first path. This second path is more pragmatic than aesthetic; that's the route the mailman takes.



LONICERA SEMPERVIRENS, coral honeysuckle

As I write this, in early January, the yard looks its worst. It is brown and dormant. Fallen leaves are beginning to decompose, bringing natural nourishment to the soil. But notice, I said it looks its worst — I did *not* say it looks ugly. There is real beauty here. The low morning sun hits the inland seaoats (*Chasmanthium latifolium*), making the seedheads glow golden and bringing out hints of purple in the dark yellow stalks. Patches of green showing along the path and amidst the fallen leaves are tufts of native sedge and the leafy rosettes of various herbs and wildflowers, such as avens, greeneyes *(Berlandiera texana)* and obedient plant *(Physostegia virginiana)*.

In February, my natural garden starts off with a sprinkling of Missouri violets *(Viola missouriensis* — ours are palest lavender with purple markings) and crow poison *(Nothoscordum bivalve)*, both of which are in abundance in the older woodland on the other side of my driveway. In April, things really get exciting. On the back wall are two vines. First to bloom is sweet-smelling Carolina jessamine *(Gelsemium sempervirens)* and then the hummingbird-tempting coral honeysuckle *(Lonicera sempervirens)*. In wet years, these are accompanied by wild red columbines *(Aguilegia canadensis)* and the dainty white fringe of meadow rue *(Thalictrum dasycarpum)*. Always, there are two kinds of ruellia (*Ruellia* spp.), one

lavender and one purple, two kinds of spiderwort (*Tradescantia* spp.), one grasslike and blue and the other more upright and purple, and my beloved *Phlox pilosa* that perfumes the air. By mid-spring, there are Louisiana irises, also in shades of blue, lavender, purple and cerise.

I usually weed twice during this period. The first time, I pull out all the pecan trees that the squirrels planted the previous fall. The second time, I laboriously dig out all the pecan trees I missed the first time.

As the weather gets hotter, the garden moves into its summer mode. The grassy spiderwort continues to bloom. A cultivar of wild hydrangea *(Hydrangea arborescens)* raises its white heads, and the tiny white strawberrylike blooms of avens float through the garden. Then, the yellow daisies come into dominance. Greeneyes *(Berlandiera texana)* with its soft, fuzzy leaves and green centers is my favorite, but I am also exceedingly fond of zexmenia *(Wedelia hispida)*. It forms a



SALVIA ROEMERIANA, cedar sage



MALVAVISCUS ARBOREUS var. DRUMMONDII, turk's cap

ground cover of scattered gold. Lanceleaf coreopsis *(Coreopsis lanceolata)* is followed by black-eyed Susans *(Rudbeckia hirta)*.

Mid-summer is when the hummingbirds come to my garden and stay until fall. To greet them are Turk's cap *(Malvaviscus arboreus* var. *drummondii)* with their red hibiscuslike flowers that never quite open, and trumpet vine *(Campsis radicans)* with its big, orange, bell-shaped blooms. Also, there are four kinds of native sages *(Salvia engelmannia, S. roemeriana, S. coccinea* and *S. greggii)* — one blue and three red. These bloomed in the spring also, but their flowers always seem more significant this time of year. Cool white summer phlox (*Phlox paniculata*) gets an occasional visit, but seems more popular with the butterflies.

Maintenance at this time of year amounts to picking up a beer can discarded by some passing yahoo. It's too hot to do anything more, and the flowers are so thick, no weed has a



WEDELIA HISPIDA, zexmenia



BERLANDIERA TEXANA, greeneyes

chance anyway.

As the weather begins to cool down into the 80s, at least at night, the fall flowers add lavender tones to the reds of summer. Wild ageratum (*Eupatorium coelestinum*) and fall obedient plant (*Physostegia virginiana*) are the strongest, but the ruellias and spiderworts usually make a comeback. Yellows are provided by the small daisies of zexmenia (which never stopped blooming) and a return of greeneyes.



EUPATORIUM COELESTINUM, wild ageratum, mist flower

After a hard freeze, I do the third day of maintenance in my garden. I cut back all the brown, ragged stalks. I weed out all the unwanted plants that arrived during the summer. I transplant and rearrange new seedlings of the flowers that did not place themselves to my aesthetic satisfaction.

The leaves from my trees — bur oak (*Quercus macrocarpa*), chinquapin oak (*Quercus muehlenbergia*), bois d'arc (*Maclura pomifera*), Shumard red oak (*Quercus shumardii*) and American elm (*Ulmus americanus*) — are allowed to stay where they fall, as are the leaves from my neighbor's too-fecund pecan (*Carya illinoinensis*). Occasionally I will uncover a flower rosette buried too far below the mulch. But mostly I just make sure the garden is bedded down under its comforter of leaves for the winter, so it will be healthy and happy and ready to go next spring.

Season after season, year after year, my natural native garden evolves and matures, offering never-ending surprises and visual treats.

I have a recurring nightmare. In it, we sell our house and move away. A year later, we drive through the old neighborhood and pass the house. My natural landscape is no more. A manicured lawn has taken its place. And the new owners are out in their yard mowing and spraying and edging and weeding. And looking very self-righteous.

Made for the Shade



Want a velvety green carpet that you won't have to mow, water, fertilize or spray? Forget about grass. Grow moss

BY DAVID E BENNER

Thirty years ago, my wife and I purchased a shady, two-acre property in southeastern Pennsylvania. The existing grass areas were pathetic and full of weeds. It would be a constant struggle just to a have a decent grass lawn on this sloping wooded terrain, I realized, and mowing would have to be done with a hand mower. Noticing small patches of mosses here and there, I envisioned entire carpets of these velvet-green plants as an alternative.



The author's garden, left and above, features wildflowers, trees, shrubs and entire carpets of velvet-green moss.



Unable to find any book on how to develop a moss lawn, I tried a simple experiment. It worked perfectly. In May 1962, I sprinkled sulfur dust on all grass areas. Six weeks later, most of the grass was dead or dying. Since the soil was already acidic, further acidification with sulfur caused the grass to simply die, along with most of the weeds. Some aluminum sulfate was also added. (A soil pH of 5.0 to 5.5 is ideal for most mosses). By fall of that year, existing moss patches had begun to spread, and new sections were growing where there was once only grass. In less than two years, moss lawns blanketed the property. There are now over twenty-five species growing here; none were planted. For twenty-eight years, there has been no grass!

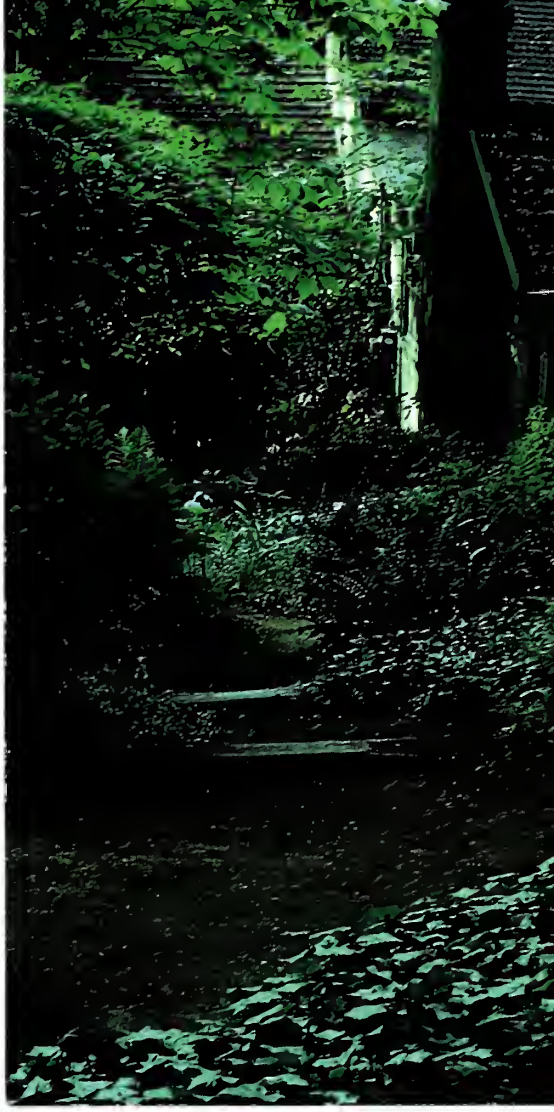
Mosses are fascinating primitive plants that reproduce by spores (not seeds) that are as fine as dust. These spores can be borne on the wind for hundreds, and probably thousands, of miles. They can land anywhere and



Top left: Moss pathways crisscross the garden. Contrary to popular belief, moss is a tough plant — tougher than grass.

Left: Haircap moss, *Polytrichum commune*.

begin to germinate when subjected to the proper growing conditions. Mosses have no true roots, but rather special structures called rhizoids that help anchor the plants wherever they happen to grow. There are over twenty thousand species of mosses worldwide that can be found from sea level to the highest mountaintops. Mosses obtain water and nutrients through their tiny leaves and stems. Because there is no protective coating on the foliage, the moisture and nutrients are absorbed very quickly. This can be seen after a severe drought, when moss plants appear brown and curled up as if dead. One brief shower, and in less than an hour these same plants are lush and green, like a miracle. Moss is a tough plant — tougher than grass. I give guided tours every spring and people ask me if you can walk on moss. I explain to them that over two-hundred visitors travel on the same moss paths (with flat heels) every year.



Top right: Another moss path ascends to the house. More than 25 species of moss grow in the garden, and nary a blade of grass.

Right: *Thuidium*, top, and *Dicranum*, bottom.



The average moss plant grows from one-half to one and one-half inches in height. The one exception is haircap moss *(Polytrichum commune)*. This is the largest of all mosses, often growing about ten inches tall. It is also one of the most common, with worldwide distribution. Easy to transplant, it will take sun or shade. This is one of the two most abundant on my grounds, creating miniature landscapes with its height and dark green color. The other is fern moss *(Thuidium delicatulum)*, which spreads quickly into large flat mats about one inch high. It has a lovely emerald-green hue and is also easy to transplant.

When thousands of moss spores alight on a soil surface, they look like a thin green film as they germinate and begin to grow. In about a year, you'll have a velvet-green carpet. Weedy plants do not fare well in shady, acid soils, and are crowded out by dense beds of moss. You not only won't have to weed your moss lawn — you won't have to mow, water or fertilize, either.

DAVID E. BENNER *is a landscape designer specializing in naturalistic gardens. He is a former assistant professor of horticulture at Delaware Valley College in Doylestown, Pennsylvania. His property and gardening techniques are featured on a new forty-five minute instructional video entitled Made In The Shade. For more information call 1-800-753-4660.*



Among the masses of wildflowers that accent the carpets of moss are spiky white foamflower and purple creeping phlox.

PLANTS TO GROW WITH MOSS

Evergreen ground covers are great accents with carpets of moss. I now have over forty species and varieties of evergreen ground covers in my garden, planted densely to prevent the growth of weeds. Remember, eliminating bare soil on your property will solve your weed and erosion problems — at least most of them. By featuring wildflowers, native shrubs and trees, as well as moss, you'll have a natural landscape that is attractive year-round. You'll be able to relax and enjoy this woodland setting, because it's practically maintenance free.

My favorite evergreen ground covers are:

NAME	HEIGHT	OUTSTANDING FEATURES
Pachysandra (*Pachysandra terminalis*)	6-12"	foliage
Vinca (*Vinca minor*)	6-8"	foliage, flowers
Foamflower (*Tiarella cordifolia*)	3-6"	flowers
Partridgeberry (*Mitchella repens*)	1"	foliage, flower, fruit
Creeping Phlox (*Phlox stolonifera*)	1"	flowers
Shortia (*Shortia galacifolia*)	2-4"	foliage, flowers
Bluets (*Hedyotis caerulea*)	1/2"	flowers
Christmas Fern (*Polystichum acrostichoides*)	12-18"	foliage

TIPS ON GROWING MOSS

- Make sure the soil is acid. You can test with a simple pH soil-test kit, available at most garden centers. The soil should be around 5.0 to 5.5. If necessary, add sulfur, ferrous sulfate or aluminum sulfate as follows:

PH TO START	PH DESIRED	POUNDS OF MATERIAL PER 100 SQUARE FEET		
		ALUMINUM SULFATE	FERROUS SULFATE	SULFUR
8.0	5.5	13.5	25.9	5.5
7.5	5.5	11.5	23.5	5.0
7.0	5.5	9.0	16.5	3.5
6.5	5.5	6.5	11.8	2.5
6.5	5.0	10.5	18.8	4.0

Spread the materials on top of the soil and/or grass in spring or early summer. The two sulfates will lower the pH in about two weeks; sulfur takes six to eight weeks. They will only make the first few inches of the ground more acidic and will not effect other flowering plants, shrubs or trees.

- Mosses I have grown do best on a compact, clay-type smooth soil surface. Poor ground is superior to a rich, fertile soil.

- Banks and steeper slopes are a problem because rain continually washes the spores away before they can germinate. Use railroad ties, logs or rocks to deflect water run-off in these areas until the moss has taken hold.

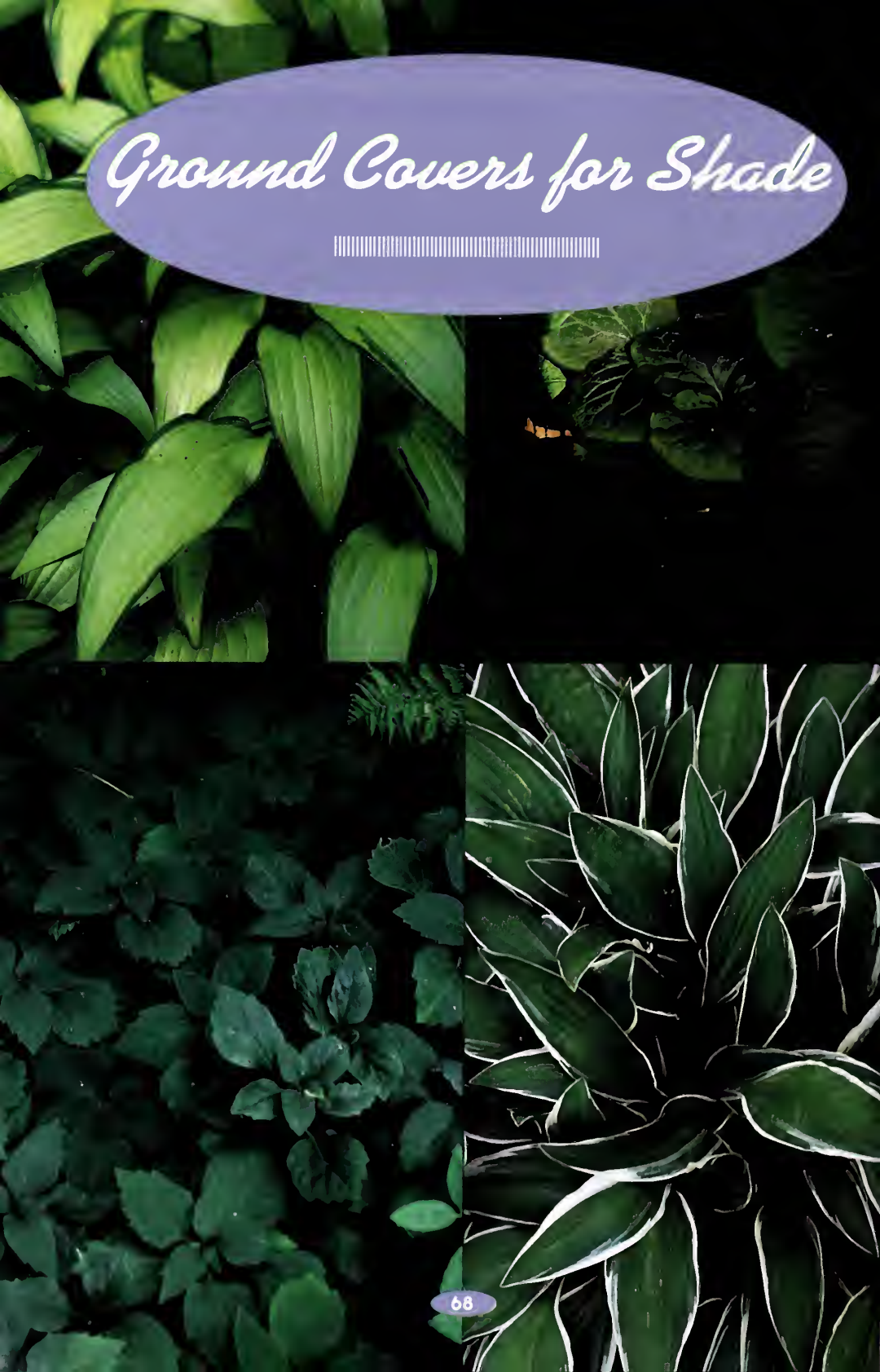


- Moss can be transplanted, preferably in early spring when the weather is cool and the earth moist. When moving moss, take small clumps with a little soil to keep the plants from falling apart (one exception is fern moss, which can be rolled up without any soil and remains intact). Loosely scratch the ground where you will be planting and press the moss down firmly so there are no air spaces between the plants and soil. Be sure to keep the area moist for several weeks.

- Another way to establish moss is to put a handful in a blender with one-half teaspoon of sugar and one can of beer. Spread this soupy mixture over bare ground or rocks. I have tried this twice, and it really works. You can substitute buttermilk for beer. You can also put bricks in a container of shallow water and cover the tops of the bricks with this mixture. Place in a cool, shady spot.

- There is one important maintenance chore involved with beds or lawns of moss: remove all covering leaves in the fall. Moss plants will smother and die if the leaves remain. So, how do you rake off the leaves without disturbing the moss? It's difficult, but there are some easy solutions. One is to blow the leaves away with a leaf blower. Another is to rake them with a plastic rake when the ground is frozen. I've found the best method is to spread one-quarter-inch plastic mesh netting over the moss the end of August. When all the leaves have fallen, simply roll up the netting and put the leaves on your compost pile.

Ground Covers for Shade



Why struggle with lawn when there are scores of interesting plants that thrive in low light?

BY KEN DRUSE

When you think of ground covers for shade, you most likely picture the three familiar standbys: *Vinca minor* (vinca or periwinkle), *Pachysandra terminalis* (pachysandra or Japanese spurge) and *Hedera helix* (English ivy). They are good and reliable plants; but by no means is the selection limited to these. Even within their genera are options. There are well over one hundred varieties of English ivy — several of which are evergreen. One pachysandra has variegated foliage (*P. t.* 'Variegata') and new introductions are more compact and have lobed or serrated leaflets. There is even an American native species, *P. procumbens*, Allegheny spurge.

Finding a ground cover for a specific site has as much to do with the desired effect as with its covering potential and shade tolerance. Any plant that "covers" is a candidate — that is, if it spreads in some way — either by underground stems, stolons or runners, ever-expanding clumps or simply by growing wider and wider above the ground.

The big three all have flowers. Vinca has lovely violet flowers in spring, and there are varieties available with wine-red or white ones. Pachysandra has fuzzy flower spikes at the ends of the stems. Ivy blooms when it is mature: The flowers are insignificant, but the fruits, black beads in umbrellalike clusters, are quite ornamental. However, none of these is grown for its flowers; and truly, many of the best ground covers have flowers that are nothing to speak of.

The wild gingers are low foliage plants for shade. Most are slow to become generously established. The two most popular are the American deciduous native, *Asarum canadense*, with matte green leaves, and the usually evergreen

Clockwise from top left: *Hosta* 'Kabitan', *Asarum canadense*, *Hosta* 'Louisa' and *Pachysandra procumbens*, allegheny spurge.

European ginger, *A. europaeum*. *A virginicum* is a solid green form with shiny, heart-shaped leaves. *A. arifolium*, called *Hexastylis arifolia* in the South, has arrow-shaped leaves mottled with silver. Among the most beautiful is *A. shuttleworthii* with exquisite silver-flecked or veined green leaves, but it is not as winter hardy as *A. canadense* or *A. europaeum*. You would have to crawl on the ground to see the flowering structures of these plants — reddish brown, upside-down urns about a half inch long that nearly touch the soil.

Plants whose foliage resembles the gingers include the natives *Galax urceolata* and *Shortia galacifolia*. Although considered here for their foliage, they are prized for their lovely flowers in woodland gardens. The former has white stars on a spike thrust above the foliage; the latter, white or pink fringed bells.

Pulmonarias, the lungworts (the "wort" refers to a plant once thought to possess medicinal value), have spectacular fuzzy green leaves that are often speckled, striped or splashed with silver. They also have long-lasting flowers — blue, pink, red or white. There are other ground covers with beautiful flowers, such as *Phlox stolonifera*, creeping phlox, with ten-inch-tall pink, white or lavender flower stalks that completely hide the three-inch-high foliage in spring. *P. divaricata* will colonize an area in time, and has some of the most beautiful flowers of the spring — most often blue, but there are white-flowered varieties and deep lavender with a red eye.

For temporary color and cover, impatiens can't be surpassed. If these annuals get too tall, cut them back — even to leafless stems — and they'll come back in short order. But beyond this ubiquitous shade-appreciating annual, there are many flower-border perennials to use as ground covers. For example, in partial shade, try *Astilbe chinensis pumila* with orchid-lavender flowers. *A.* 'Sprite' has handsome pink flowers and wonderful ferny foliage. Both are short in stature.

Some of the lowest covers include the beautiful flowering ajugas, which are desirable for their leaf colors and spring flowers on spikes that shoot up above the foliage. *Ajuga reptans* 'Burgundy Glow' has gray-green leaves suffused with magenta and wine-purple and edged in white. *A.* 'Metallica' is one of the most common and vigorous varieties and will run-over other selections. It has very pretty leaves much like beet green. *A.* 'Silver Beauty' has green and white foliage and like the others is a more moderate spreader than 'Metallica'. *A.* 'Argentea' actually does have silvery foliage. All of these have spiky blue flowers in spring. *Lamium*

Clockwise from top left: *Epimedium grandiflorum*, *Lamium maculatum*, *Vinca minor* and *Epimedium pinnatum*.











maculatum, the dead nettles, come in several varieties. *L.m.* 'Beacon Silver' has silvery leaves with green margins and deep pink flowers. The cultivar 'White Nancy' has beautiful white flowers.

Other flowering ground covers include the Lily-of-the-valley (*Convallaria majalis*), whose familiar fragrant bells are borne around Father's Day. Violets can be considered either desirable covers or the lawn-lover's nemesis, but some of the more unusual kinds might have the makings of a collection. Look for creeping *Viola labradorica* with maroon foliage, and *V. cucullata* 'Freckles' with speckled flowers, for two of the more interesting and easy-to-grow kinds. If you have a bit of sun, comfrey (*Symphytum grandiflorum*) with tons of cream-colored flowers, is astonishing.

Green and gold (*Chrysogonum virginianum*) is a native ground cover that looks a bit like a trailing *Rudbeckia*. It will bloom through the season in dappled shade, and can grow with average to dry soil moisture. *Lysimachia nummularia* (moneywort or creeping jenny) has tiny, green, coin-shaped leaves and lovely yellow flowers held close to the low, trailing stems. It likes moist spots. There is a wonderful variety with chartreuse leaves (*L.n.* 'Aurea', but it is not as vigorous as the species, and needs more sun).

Galium odoratum is the common sweet woodruff — once used to flavor May wine. It has delicate whorls of light green leaves on trailing stems, and is covered with snowy white flowers in mid to late spring. It makes an airy cover under open shrubs such as deciduous azaleas. Foam flower, *Tiarella cordifolia*, is known for its fuzzy white or pink floral spikes — rightly so, but don't overlook the handsome maplelike foliage. As a colony of these native plants ages and increases in size, it will prove a dense cover. With gentle help from you, dividing and replanting every spring, the process can be accelerated. Heucheras can be used similarly — some species and varieties want more sun than others. Although the heucheras flower (they are commonly called coral bells for the little bell-like flowers on tall wiry stems), some have simple, pale blooms that are barely noticeable for the color and size of the leaves. Look for varieties of *H. americana* and *H. villosa* for naturalizing.

When there is competition from tree roots — the dreaded dry shade — you'll have to experiment. It isn't a good idea to pile soil on top of tree roots. That

Clockwise from top left: bronze-edged epimedium, *Asarum shuttleworthii*, *Ajuga* 'Burgundy Glow' and a variegated liriope.

could kill the trees by cutting off moisture and air. In the worst-case scenarios — maple or beech trees — consider planting in containers raised above the ground on bricks. Impatiens or coleus can fill wooden tubs, or you might build a permanent stand for summering house plants there. In light shade, perhaps between the exposed roots of trees and among stones of a somewhat shady rock garden, try *Iris cristata*, the crested iris. This tiny rhizomatous plant has lavender or white flowers. Look also for new cultivars with flowers in a range of shades from light to deep purple.

In the dry shade beneath deeply rooted trees you might also try epimediums, the barrenworts. These plants like some sun for good flowering, but seem to tolerate root competition if the soil is rich in humus. Flowers come in nearly every color but true blue. *E.* x *youngianum* 'Niveum' is a low-growing hybrid with spectacular snow-white flowers. *E. grandiflorum* has large flowers that face the ground and have petals the color of grape lifesaver candy with pale centers.

Liriope species, sometimes called lilyturf, are grown for their strappy, semievergreen, grassy leaves. There are several variegated forms. And all have hyacinthlike flowers, most often violet, sometimes white. They often produce attractive black berries. I think this is a difficult plant to blend well in the garden — especially the variegated ones, which can be rather bright yellow and green. But they can be effective if used to edge a long sidewalk in the shade of the house, or when the strappy texture is contrasted with dissimilar foliage such as hosta leaves.

Hostas are, of course, about the best known herbaceous perennials for shade, and any of them can be used as ground cover. Kinds that "fill in" rather than just form round clumps are especially useful. These spreaders include *Hosta* 'Allan P. McConnell', *H. gracillima* 'Variegated', 'Ground Master', 'Kabitan', 'Gold Standard' and 'Louisa'. You can also collect some of the golden-leafed varieties such as 'Golden Scepter' or 'Wogon Gold', so that you can "light up" the shade with a colorful ground-covering plant. All of these bloom, too.

Most of the plants mentioned above are recommended for those parts of the country that receive at least 40 inches of rain a year and in which forest is the dominant native plant community. Gardeners in other regions can also perk up the shade using easy-care ground covers appropriate for their areas.

KEN DRUSE *is the author of* The Natural Garden *(1989)* The Natural Shade Garden *(1992) and the forthcoming* The Natural Habitat Garden *(1994), all published by Clarkson N. Potter. He gardens in New York City.*

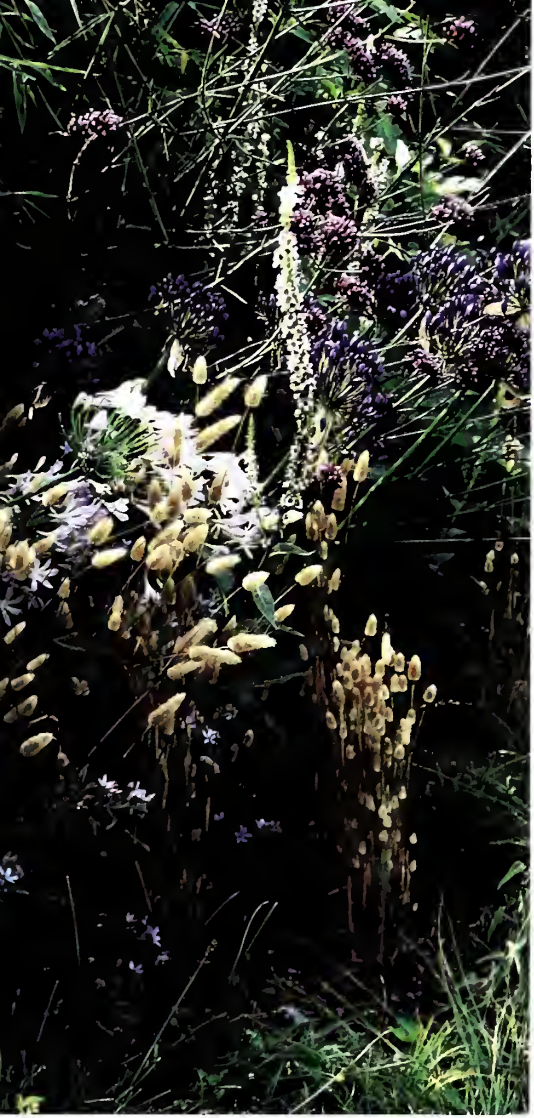
Sedge Lawns

The new American lawn

By John Greenlee

A few breakthroughs in the history of turf have been as significant as the arrival of a whole new kind of lawn — the sedge lawn. Sedges are close botanical cousins of the grasses and look a lot like them. Properly selected and planted, sedges can function as a traditional lawn and require little or no mowing, fertilizing or chemicals. Some require less water than many conventional turf grasses. Others tolerate wet, moist areas, and many thrive in shade. What's more, sedge lawns restore something of the character of the native sods that existed before agriculture and development transformed the American landscape.

A meadow of Pennsylvania sedge, *Carex pennsylvanica*. Sedges are best grown in the regions in which they are native.



Sedge meadow meets informal flower border in southern California.

The conventional lawn, which, believe it or not, now covers more than 50,000 square miles across the continent, consists of grasses from Africa, Asia, Europe and other places. The native sods composed of sedges and grasses have largely been replaced by these foreign, high-maintenance species. It has reached a point that today, very little remains of the native sods. Perhaps the new American lawn is the original sod just waiting to be rediscovered.

Part of the attraction of the genus *Carex*, into which sedges fall, is its tremendous variety and adaptability. There are more than 2,000 species of *Carex*, and they are found in a wide range of habitats in nature. They vary from miniatures with foliage only one to two inches high, to specimens growing to three or four feet. Some creep, some clump, some do a little of both. They can be found in sun or shade, in wet soils or heavy clay, from coastal dunes to alpine scree. In almost every ecosystem, there is at least one *Carex*. In most there are many, and at least one candidate with good lawnlike qualities.

Five sedges that have shown excellent promise as substitutes for traditional lawn grasses are *Carex texensis*, the catlin sedge, *Carex planostachys*, the cedar sedge, *Carex pennsylvanica* var. *gracilifolia* and other varieties of Pennsylvania sedge, *Carex pansa*, the California meadow sedge, and *Carex praegracilis* 'Laguna Mountain', a selection of the western meadow sedge.

These five native sedges have been selected for their compact growth, good green color and mostly evergreen foliage. They also tolerate varying degrees of

shade and competition from tree roots.

Below are descriptions of the five *Carex* species. They are best grown in the regions in which they are native and to which they are adapted. Many more sedges are being collected and identified in the wild, and hybridization also offers enormous possibilities.

Carex texensis

(formerly Carex retroflexa)

Catlin Sedge

This native Southwestern sedge has naturalized in parts of California. It mingles in nature with other sedges and it or close relatives are adapted to a wide range of the southern United States with proven hardiness to USDA zone 7. It makes a fine lawn or meadow, both mowed and unmowed. It tolerates a close mowing and grows 3" to 4" unmowed. It will grow from seed or plugs, though seed may be hard to come by. Plant plugs 4" to 8" on center. Mowing will increase sod formation. The catlin sedge is clumping by nature, so plant plugs close together for lawns. This sedge makes a fine lawn for southern California. It thrives in sun or shade and looks best with regular water.



Catlin sedge comes right up to and mingles with the flowering border. It can be mowed or left unmowed.

Carex planostachys

Cedar Sedge

This Texas native is another fine lawnlike sedge. It is drought and moisture tolerant with dark green foliage 4" to 6" high. It is slowly creeping, almost clump forming. It

does equally well in sun or shade, and is hardy to USDA zone 6 and possibly lower. Plant from plugs; it is largely untested from seed. Plant plugs 6" to 8" on center. It looks best with regular water but will tolerate periods of summer drought.

CAREX PENNSYLVANICA

Pennsylvania Sedge

The Pennsylvania sedge has a wide distribution throughout the eastern United States. Extremely adaptable and widely variable in nature, this sedge and its varieties are some of the most promising lawn substitutes. Some are creeping, others form dense mats or tufts or form clumps. They vary from 1" to 2" miniatures to 8" to 10" clones. A particularly fine cultivar, *C. pennsylvanica* var. *gracilifolia* 'Hilltop', is a selection from Towson, Maryland. Its extremely graceful, dark green foliage holds its color throughout the winter. It makes a durable lawn for sun or shade and is tolerant of close mowing and heavy traffic. The hilltop sedge grows 2" to 4" high unmowed. Early indications are that this sedge will do fine in the Pacific Northwest as well. Many more forms of this species are certain to come. Plant *Carex pennsylvanica* from plugs 6" to 8" on center.



A mixed sedge lawn, predominanthly catlin sedge, with annual grasses in Pomona, California.

Carex pansa

California Meadow Sedge

Native from California to Washington, this sedge makes an excellent lawn, growing 4" to 6" high unmowed with a slowly creeping, non-invasive habit. Though somewhat slow in heavy soils, it will cover quickly in well drained, sandy soils. It tolerates heavy clay but prefers good drainage and full sun. It also tolerates medium shade with ease. Plant plugs 6" to 12" on center. This is a good choice for heavy traffic areas as the sod can repair itself.

Carex praegracilis

Western Meadow Sedge

This native western sedge and its varieties are found throughout western North America. 'Laguna Mountain', a particularly fine variety collected near Laguna Mountain in San Diego County, has been selected for its dark green color and compact growth. Its slowly creeping habit makes it a fine choice for lawns in sun or shade. Tolerant of heavy soils and heavy traffic, this sedge has so far proven one of the best lawn sedges for Western gardens. It has shown good drought tolerance and should become an important part of Western horticulture in the years to come. Plant plugs 6" to 12" on center.

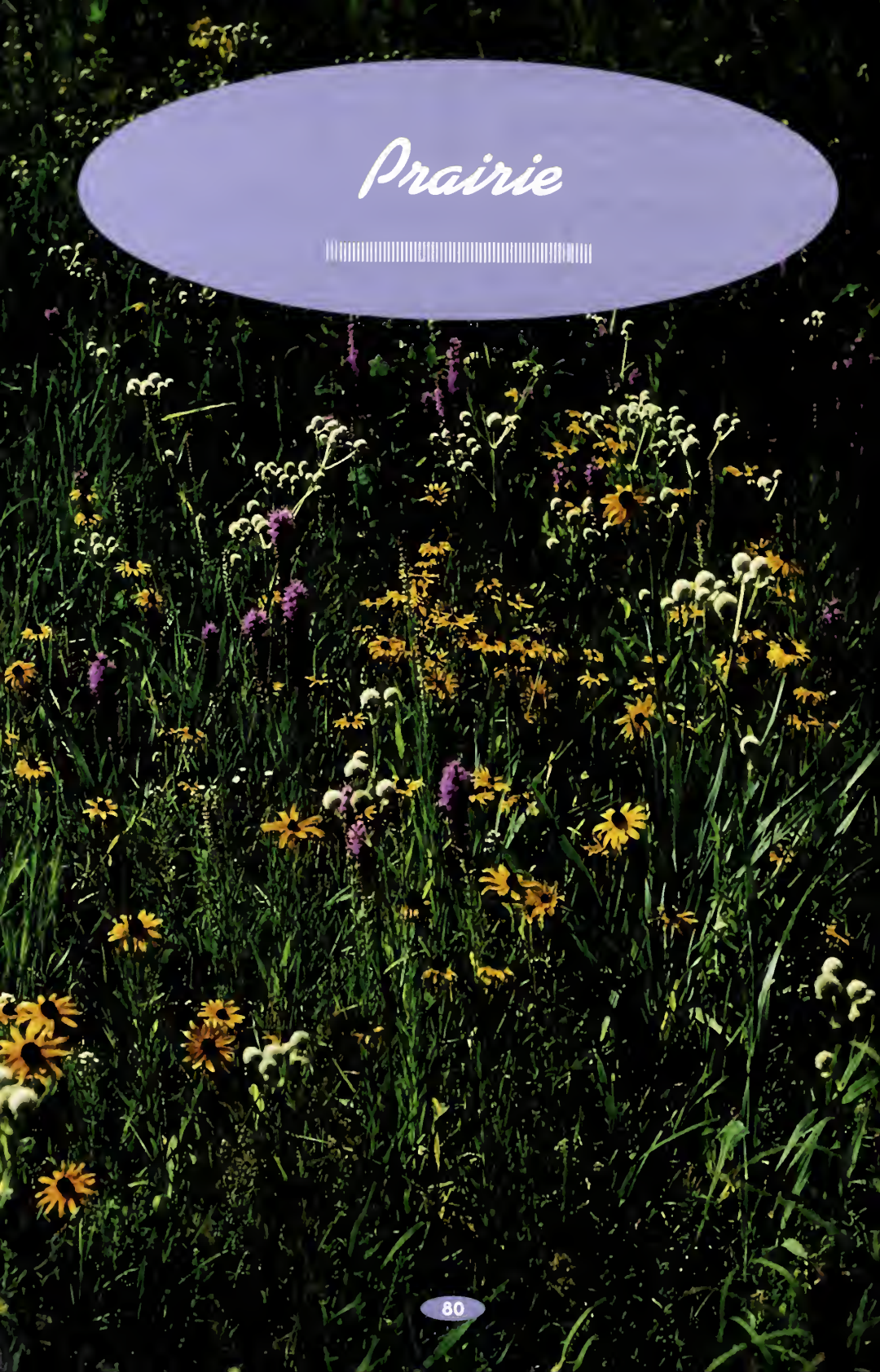
SOURCES

Kurt Bluemel, Inc.
2740 Greene Lane
Baldwin, MD 21013
410-557-7229
Catalog, $3

Greenlee Nursery
301 E. Franklin Avenue
Pomona, CA 91766
714-629-9045
Catalog $5

Prairie Nursery
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Westfield, WI 53964
1-800-GRO-WILD
Catalog, $3

John Greenlee *established Greenlee Nursery in 1985. He is the author of* An Encyclopedia of Ornamental Grasses *(Rodale, 1992).*


Prairie

An all-American lawn alternative

BY NEIL DIBOLL

Are you tired of spending valuable free time mowing and maintaining your lawn? Would you like to help preserve part of our natural heritage and restore valuable habitat in your backyard? Then you should seriously consider converting your lawn into a native prairie.

Interest in using native prairie grasses and wildflowers in the landscape has been growing at a rapid rate. These include a wide selection of showy flowers and ornamental grasses that require a minimum of maintenance. What's more, there is little or no need to use chemicals in the prairie landscape. Once established, prairies require no fertilizing, no watering, no spraying, little weeding and only annual mowing. There are prairie plants for dry soils, regular soils and moist soils. Prairie flowers provide a succession of bloom from spring into fall, and the late-season color of the grasses provides interest well into the winter. Butterflies and hummingbirds are attracted to the flowers, and songbirds utilize the ripening seeds in autumn. The overall effect is a dynamic, ever-changing landscape that reflects the rhythm of the seasons, year after year.

The first prairie plantings were done by ecologists whose primary interest was to preserve these plants from impending extirpation. Only 150 years ago, vast grasslands stretched as far as the eye could see, blanketing much of America's heartland with an ocean of colors and textures. Today, prairie is one of the rarest plant associations on the continent. The soil that the deep-rooted prairie grasses and flowers had created over the centuries was so fertile that it was systematically converted into cropland, leaving only a few small fragments in the odd corners where the plow did not reach. In a matter of decades, corn and wheat had replaced a complex and unique plant community. The prairie was almost completely destroyed before it could be studied and fully appreciated.

Over the centuries, the native prairie plants have evolved to survive the extreme conditions of the Upper Midwest — drought, searing summer heat, severe winters and the ravages of grazing by vast herds of bison and elk. In response, they have developed root systems double or triple the size of their

above-ground growth. These large below-ground reserves of energy allow the plants to survive unfavorable conditions and recover from damage rapidly. The prairie grasses produce a thick mat of finely divided roots in the upper three to four feet of the soil, with some extending as far as nine feet deep. In order to compete with the grasses, many of the prairie flowers have root systems that extend far below those of the grasses, up to 15 feet and more in some cases. Others have enlarged underground storage organs such as bulbs, corms and rhizomes that allow them to endure periods of severe stress.

In addition to sharing the soil environment, prairie plants subdivide the growing season among themselves. Some experience peak activity in spring, some in summer and others in early fall. The average height of the plants in flower also increases as the season progresses, with taller flowers coming up over the earlier-blooming, shorter members of the community. Many of the spring-blooming prairie flowers go dormant or near-dormant by midsummer, making way for the coneflowers, blazingstars, sunflowers and myriad of other summer bloomers. Asters, goldenrods and gentians produce the season's floral finale. Then, with the first frost, the various grasses don their winter plumage of bronze-reds and golden straw colors. In this way many different plants can occupy a given area, with each contributing to the successive waves of color that wash across the prairie landscape.

Seeds or Plants?

When you think of a prairie, the image of a seemingly endless meadow rolling toward the horizon probably comes to mind. However, prairie plants can be used in a variety of situations, from gardens a few square feet in size to plantings of many hundred acres. Almost all of the prairie plants can be used effectively in borders, either mixed with other perennials or as a "pure prairie" garden. More and more gardeners are creating small meadows of one acre or less, often to replace high-maintenance lawn. More and more people are discovering that their prairie meadow offers them a far more exciting landscape than their lawn, and at a fraction of the long-term cost. There are prairie flowers for dry soils and moist soils, which often present landscaping dilemmas for less durable, traditional garden plants. Many of the shorter species are excellent candidates for rock gardens. A combination of the showier flowers makes a very effective butterfly garden, and in areas with appropriate surrounding habitat, they can also bring in hummingbirds. A large number of the flowers and grasses provide both nutritious seeds and protective cover for songbirds. Even a small planting of only a few hundred square feet can become a focal point for many of these delightful garden visitors.



Prairie dropseed, *Sporobolus heterolepsis*, in autumn.

You can establish a prairie meadow using plants or seeds, or both. Small areas of a thousand square feet or less can be easily installed using plants. A general rule of thumb is to give each plant one square foot of space, although some require less and others more. With transplants, you can control the relationship of each plant to the others and create various combinations and effects. Most transplants will bloom the year they are installed, but a few very long-lived varieties may require two years or more to reach maturity. It's not unusual for many of these plants to live for 25 years or more. Many reproduce vegetatively, producing offshoots that live on after the original portion of the plant has died.

Seeding is somewhat trickier and inevitably results in a more random effect.

It is by far the most cost-effective method for planting large areas, but requires longer for the plants to reach maturity. Many prairie seeds grow readily on an open seedbed, while some require very specific conditions for germination and growth. This is why plants and seed are sometimes used in conjunction with each another. First the seeds are planted. Then transplants of the more difficult-to-grow species are installed, either directly following seeding or one or two years later, after the seeded area has become established.

Preparing the Site

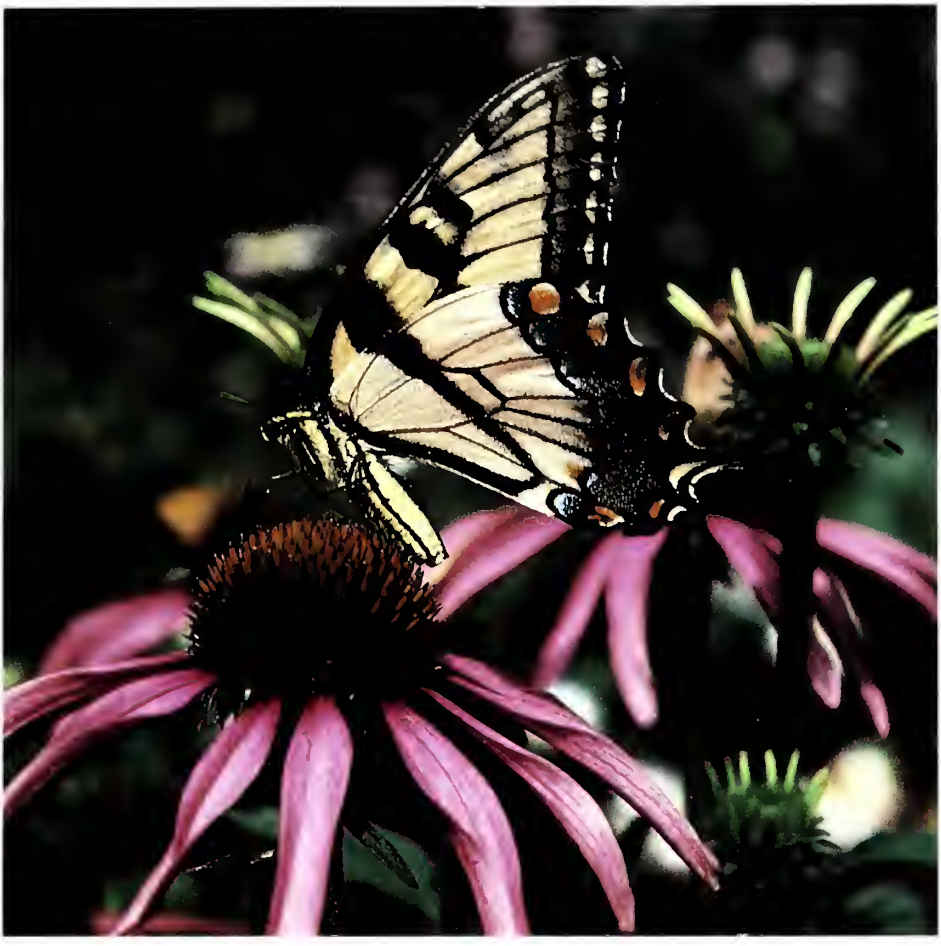
Whether you're using seeds or plants, make sure that the area to be planted is free of grass, weeds, brush or any other competing vegetation. Most native plants are long lived, but slow growing. Weeds grow rapidly and can outcompete and stunt your wildflowers and grasses in the early going. Gaining control of the planting zone is your first priority.

There are a number of ways to prepare your site. On small areas, sod can be dug out, or removed using a sod-cutter. Or you can smother the undesirable plants using black plastic, old pieces of plywood or any other material that cuts off sunlight to the plants below. Leave the soil covered for two to three months during the growing season to kill the plants there. If brush or small trees are present, you'll need to mow them back to the ground before smothering.

The simplest way to prepare a large area in a short time is to use a low-toxicity glyphosate herbicide, such as Roundup. Spray the area when the plants are actively growing and well developed. Lawns can be killed with a single spraying in fall or spring. Because not all plants will be affected by the herbicide at any given time of the year, weedy fields may require repeated spraying, two or three times, throughout the growing season.

If you prefer not to use herbicides, you can work up the area by repeated tilling. Lawns can usually be prepared for planting with only two good tillings. Beware of weedy fields or lawns with weedy grasses in them! Simply plowing or tilling will not do the job. Rhizomatous perennial weeds are particularly difficult to kill, because they can resprout from a small section of root. You may have to till the area all summer long, every two to three weeks in order to kill difficult weeds such as quackgrass, Canada goldenrod, Canada thistle and Johnsongrass. If your site is sloping or rolling, tilling may not be an option, as it may encourage erosion. Clay, loamy and silty soils tend to be more subject to erosion than sandy soils. Glyphosate herbicide may be the best option for erodible soils on sloping sites.

Small areas of a few thousand square feet can be successfully seeded by hand



A swallowtail perches on a purple coneflower, *Echinacea purpurea*.

broadcasting seed and raking it into the soil, then rolling the area to assure firm seed-to-soil contact. The procedure is very similar to planting lawn grass. However, much less prairie seed is required per area compared to lawn grass, so the prairie seeds must be mixed with sawdust, vermiculite or peat moss to dilute them to ensure good coverage.

To increase germination, water for the first two months after planting. Water only in the morning to prevent fungal disease problems that can occur with night watering. After two months, your seedlings should have good root systems and will only need to be watered during prolonged dry spells during the first summer.

The first year after seeding a prairie planting, many people are exasperated

when all they see is a field of weeds! But there's no reason to despair, as prairie denizens concentrate first on building their tremendous root systems. In the first year, many of the seedlings may only grow to one or two inches in height, yet have roots well over a foot long. By the second year, biennials such as black-eyed Susan will make their appearance, and a few of the faster-growing perennial flowers and grasses may bloom. In the third year, many different flowers will reach maturity and weeds should become less abundant as the native vegetation squeezes them out. By the fourth and fifth years, with a small amount of management (burning, or mowing and raking in mid-spring), the prairie plants should be in full control and well on their way to forming a long-term, self-sustaining community. As with any investment, patience is required. Five years is not long to wait for a landscape that will last a lifetime.

Dry, Medium or Moist Soils

There are prairie plants for almost any type of soil, be it dry, medium or moist. The shorter varieties tend to occur on dry, sandy or gravelly soils, as these soils generally possess lower levels of moisture and nutrients and cannot support the needs of most larger plants. Heights range from a few inches up to three or four feet tall. Some of the deeper-rooted taller flowers and grasses can also grow on dry soils, but the shorter ones tend to predominate and many are restricted to this environment. Many spring and fall-blooming species are common to dry prairies, because higher moisture levels and lower temperatures provide better growing conditions during these seasons. Soil moisture often becomes limiting during the heat of summer on dry soils, and only those plants with very deep roots or special adaptations can remain active. Nevertheless, a good selection of summer-blooming flowers is available for dry soils. Indeed, low-nutrient dry soils are often the easiest to successfully seed to native flowers and grasses because they do not provide a hospitable environment for large weeds that can overtop the young seedlings and retard their growth. Fertile soils, on the other hand, are often subject to heavy weed growth and usually require mowing to a height of six inches once or twice in the first year to allow light to reach the prairie seedlings below.

The widest selection of prairie flowers grows on well drained medium or "mesic" soils, such as sandy loams, silt loams and clay loams. Mesic soils were home to the tallgrass prairie. These soils have enough water- and nutrient-holding capacity to support most of the taller flowers, and many of the shorter varieties will grow well on these sites as well. Most range in height from two to five feet, with a few that will reach six feet or more. Because mesic soils can supply good levels of



Nodding pink onion, *Allium cernuum*, is a good choice for soils that aren't too dry or too moist.

moisture well into the growing season, blooming activity peaks during the long hot days of summer. This explosion of color in June, July and August is the hallmark of the mesic prairie. When most of the wildflower gardener's woodland flowers have finished blooming and the lawn is threatening to call it quits without its daily dose from the sprinkler, there stand the prairie flowers in their greatest glory!

The zone of transition between wetlands and the upland prairie is the natural habitat of the moist prairie. Here are found some of the grandest and most robust of all our native herbaceous perennials, along with some of the showiest — queen of the prairie, cardinal flower, turk's cap lily, prairie blazingstar, New England aster and many other beauties. Most members of the wet prairie com-

munity grow to four or five feet, but a few can reach as high as eight to ten feet.

Because wet soils are slow to warm up in spring, most floral activity occurs from mid-summer into early autumn. Many of these plants are capable of withstanding extended periods of flooding when dormant (from late fall until early spring), and are ideal for landscaping along pond edges and streambanks. However, most of them require an unsaturated, aerated zone in the upper soil during the growing season, and should not be planted in areas with standing water all year long. They will also thrive in a rich garden soil that is supplied with sufficient moisture, and some are capable of growing on mesic soils as well.

With this diversity of spectacular native plants suitable for a variety of applications, it's clear why prairie plants are growing ever more popular. Although little now remains of these once-vast flower gardens, the plants that composed them live on. Today, we can incorporate these beautiful flowers and grasses into our own landscapes and enjoy their constantly changing parade of color year after year. And with all the time saved on maintenance, that leaves more time for enjoyment!

NEIL DIBOLL *is President of Prairie Nursery in Westfield, Wisconsin.*



Joe Pye weed, *Eupatorium maculatum*, thrives in moist soils.

Prairie Plants

For Dry, Sandy Soils

Leadplant (*Amorpha canescens*)
Pasque flower (*Anemone patens*)
Sky blue aster (*Aster azureus*)
Heath aster (*Aster ericoides*)
Smooth aster (*Aster laevis*)
Silky aster (*Aster sericeus*)
White aster (*Aster ptarmicoides*)



JOANNE PAVIA

Butterflyweed (Asclepias tuberosa)

Canada milk vetch (*Astragalus canadensis*)
Harebell (*Campanula rotundifolia*)
Lance-leaf coreopsis (*Coreopsis lanceolata*)
Pale purple coneflower (*Echinacea pallida*)
Flowering spurge (*Euphorbia corollata*)
Downy sunflower (*Helianthus mollis*)
Western sunflower (*Helianthus occidentalis*)
Alum root (*Heuchera richardsonii*)
Rough blazingstar (*Liatris aspera*)
Dwarf blazingstar (*Liatris cylindracea*)
Dotted blazingstar (*Liatris punctata*)
Hairy puccoon (*Lithospermum carolinense*)
Lupine (*Lupinus perennis*)
Bergamot (*Monarda fistulosa*)
Dotted Mint (*Monarda punctata*)
Beardtongue (*Penstemon grandiflorus*)
Purple prairie clover (*Dalea purpurea*)
Prairie buttercup (*Ranunculus rhomboideus*)
Black-eyed Susan (*Rudbeckia hirta*)
Stiff goldenrod (*Solidago rigida*)
Showy goldenrod (*Solidago speciosa*)
Spiderwort (*Tradescantia ohiensis*)
Hoary Vervain (*Verbena stricta*)
Big bluestem (*Andropogon gerardii*)
Little bluestem (*Schizachyrium scoparium*)
Sideoats grama (*Bouteloua curtipendula*)
Canada wild rye (*Elymus canadensis*)
Junegrass (*Koeleria cristata*)
Switchgrass (*Panicum virgatum*)
Indiangrass (*Sorghastrum nutans*)
Prairie dropseed (*Sporobolus heterolepsis*)



JERRY PAVIA

Prairie smoke (*Geum triflorum*)

For Medium Soils

Nodding pink onion (*Allium cernuum*)
Butterflyweed (*Asclepias tuberosa*)
Sky blue aster (*Aster azureus*)

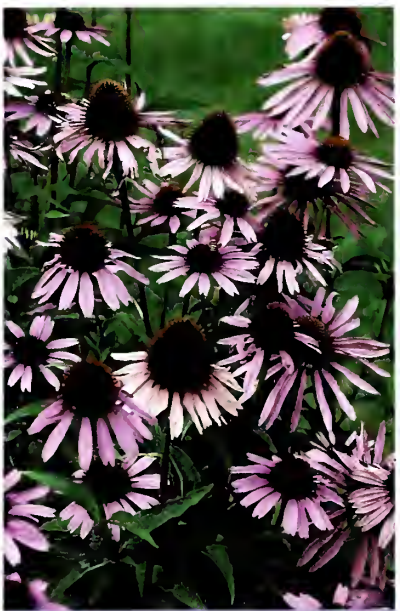


New England aster (*Aster novae-angliae*)



Blue false indigo (*Baptisia australis*)

Smooth aster (*Aster laevis*)
White false indigo (*Baptisia lactea*)
Cream false indigo (*Baptisia leucophaea*)
New Jersey tea (*Ceanothus americanus*)
Shootingstar (*Dodecatheon meadia*)
Pale purple coneflower (*Echinacea pallida*)



Purple coneflower (*Echinacea purpurea*)

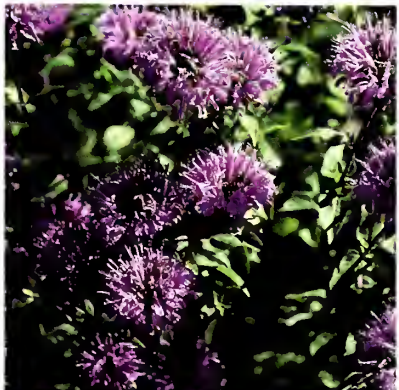
Rattlesnake master (*Eryngium yuccifolium*)
Ox-eye sunflower (*Heliopsis helianthoides*)
Prairie blazingstar (*Liatris pycnostachya*)
Rocky Mountain blazingstar (*Liatris ligulistylis*)
Wild quinine (*Parthenium integrifolium*)

Smooth penstemon (*Penstemon digitalis*)

White prairie clover (*Dalea candida*)



Heartleaf golden Alexanders *(Zizia aptera)*



Bergamot *(Monarda fistulosa)*

Great Solomon's seal (*Polygonatum biflorum*)

Yellow coneflower (*Ratibida pinnata*)

Sweet black-eyed Susan (*Rudbeckia subtomentosa*)

Compassplant (*Silphium laciniatum*)

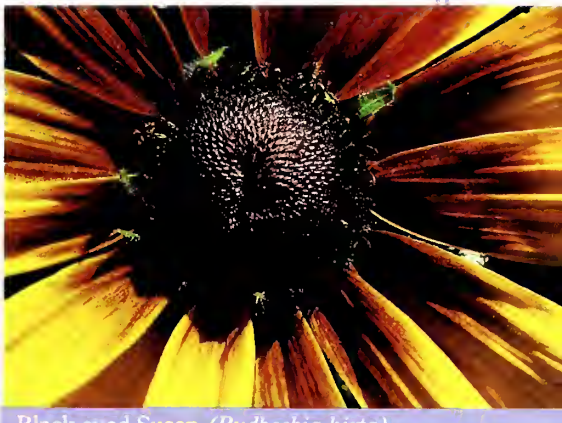
Prairie dock (*Silphium terebinthinaceum*)

Stiff goldenrod (*Solidago rigida*)

Spiderwort (*Tradescantia ohiensis*)

Culver's root (*Veronicastrum virginicum*)

Big bluestem (*Andropogon gerardii*)



Black-eyed Susan *(Rudbeckia hirta)*

Little bluestem (*Schizachyrium scoparium*)

Canada wild rye (*Elymus canadensis*)

Switchgrass (*Panicum virgatum*)

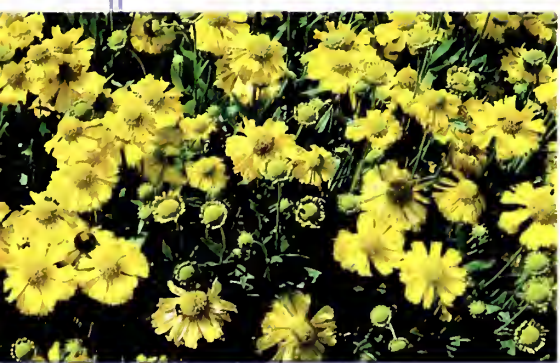
Indiangrass (*Sorghastrum nutans*)

Prairie dropseed (*Sporobolus heterolepsis*)

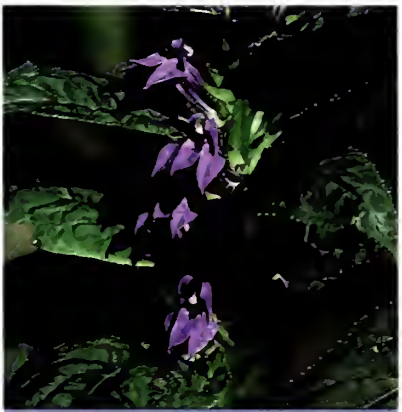
For Moist Soils

Red milkweed (*Asclepias incarnata*)
New England aster (*Aster novae-angliae*)
White false indigo (*Baptisia lactea*)
Turtlehead (*Chelone glabra*)
Tall coreopsis (*Coreopsis tripteris*)
Joe Pye weed (*Eupatorium maculatum*)
Queen of the prairie (*Filipendula rubra*)
Bottle gentian (*Gentiana andrewsii*)


Cardinal flower (*Lobelia cardinalis*)


Sneezeweed (*Helenium autumnale*)

Wild iris (*Iris shrevei*)
Dense blazingstar (*Liatris spicata*)
Turk's cap lily (*Lilium superbum*)


Great blue lobelia (*Lobelia siphilitica*)

Glade mallow (*Napaea dioica*)
False dragonhead (*Physostegia virginiana*)
Yellow coneflower (*Ratibida pinnata*)
Green headed coneflower (*Rudbeckia laciniata*)
Sweet black-eyed Susan (*Rudbeckia subtomentosa*)
Cupplant (*Silphium perfoliatum*)
Blue vervain (*Verbena hastata*)
Ironweed (*Vernonia fasciculata*)
Culver's root (*Veronicastrum virginicum*)
Golden alexanders (*Zizia aurea*)
Big bluestem (*Andropogon gerardii*)
Bluejoint grass (*Calamagrostis canadensis*)
Prairie cordgrass (*Spartina pectinata*)
Porcupine sedge (*Carex hystericina*)
Fox sedge (*Carex vulpinoidea*)

These plants and many more are available from Prairie Nursery. For a 2-year subscription to their 48-page color catalog, send $3 to Prairie Nursery, P.O. Box 306, Westfield, WI 53964 or call 1-800-GRO-WILD.

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Houseplants

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ELVIN MCDONALD is the former Secretary of the American Horticultural Society and Director of Special Projects at the Brooklyn Botanic Garden. He has written more than 40 books on gardening, most recently *The New Houseplant: Bringing the Garden Indoors* (Macmillan, 1993).

C. C. POWELL served on the faculty at Ohio State from 1970 until 1992. He is president of Plant Health Advisory Services in Worthington, Ohio, which trains plant care professionals. He has written four books, including *The Healthy Indoor Plant* (co-authored with R. Rosetti).

Botanical artist and photographer **ROB PROCTOR** is a frequent contributor to *Herb Companion* magazine. He is the author of *Perennials* (1990), *Annuals* (1990), *Country Flowers* (1991), *The Indoor Potted Bulb* (1993) and *The Outdoor Potted Bulb* (1993), all published by Simon & Schuster

MARY ELLEN ROSS is co-owner of Merry Gardens in Camden, Maine, where she has grown 400 different varieties of geraniums. She helped found the International Geranium Society.

JOELLE STEELE writes monthly Question & Answer columns and feature articles for *Interior Landscape* and *Pro* magazines. She has published over 500 articles in addition to six audio tapes and several books for the interior and exterior landscape trades.

KATHERINE WHITESIDE is a freelance garden and travel writer. She was a consultant and writer for the eight-part PBS series and book *Gardens of the World,* which won an Award of Merit from the Garden Writers of America. She is also the author of *Antique Flowers* and *Classic Bulbs* (1991), both published by Random House-Villard Books.

LINDA YANG is author of *The City Gardener's Handbook: From Balcony to Backyard* (Random House, 1990) and a garden writer for *The New York Times*. She was Guest Editor for the Brooklyn Botanic Garden handbook, *Town and City Gardening*.



Introduction

BY TOVAH MARTIN

ELIZABETH MACDONALD



hy are houseplants so often approached with fear and trembling? Brave gardeners who don't blink an eye before tackling the trickiest gentian suddenly become weak-kneed when a begonia crosses their path. People who have gardened outside all their lives are rendered panic-stricken by a little bitty gesneriad. Why are houseplants so intimidating?

I think I have the answer. The fear of houseplants is due to lack of education. Houseplants are the last frontier. People hesitate because no one has shown them the way. Well, this handbook is meant to quell all those fears. In these pages, experts offer insights into every aspect of indoor gardening from seed sowing to fertilizing and repotting. They tell you how to set up a light garden if you lack window space, they tell you how to grow hydroponically if you don't want to fiddle with soil mixes. I suppose that a certain percentage of the population has avoided gardening indoors because they've only encountered the ho-hum houseplants sold in supermarkets. If you think houseplants are boring, this handbook should be a real eye opener. Some incredible indoor plants are available nowadays. Take plumerias, for example, or begonias, or pelargoniums, or gardenias — you'll meet them all herein. When you grow plants indoors, bright blossoms, profuse foliage and tantalizing scents can all be at your elbow regardless of the weather outside. If you have limited space, try something miniature. If you have nothing but a north-facing window, try a foliage plant. It might surprise you to learn that some orchids are easy enough to grow and coax into blossom in the average home. The experts tell all.

Finally, I've heard some folks whisper behind my back that a plant's place is in the garden, not on the windowsill. They claim that our ancestors didn't entertain living plants on their windowsills. Actually, they're absolutely correct — the colonists *couldn't* entertain live plants indoors. They didn't have sufficient light coming through their frugal windows, they didn't have enough heat from their open hearths. And they didn't have time to lug water from the pump for extraneous chores. In fact, the Puritans didn't have time for any leisure activities. They didn't grow ornamentals indoors or outside.

But things have changed. Architecture has evolved and today's homes are well endowed with glass. Modern heating systems keep the climate well above freezing both day and night. Meanwhile, modern humidifiers can put moisture back in the air when the furnace labors too long. Best of all, gardening is becoming a well-accepted leisure-time activity. Folks who have communed with nature all summer are having trouble spending a season or two deprived of its therapeutic and aesthetic qualities.

If you find yourself yearning for flora throughout the year, don't hesitate a moment longer. No more excuses. This handbook will come to your rescue.

Let There Be Light

A guide to bulbs, ballasts and other artificial lighting basics

BY LAURA L. KRAMER

One of the greatest challenges of indoor gardening is providing enough light. Loss of daylight during the darker short days of winter not only limits flowering and fruiting, but also has detrimental effects on the health and longevity of houseplants. And that's assuming that you have a spare windowsill or two for potted plants. Even if your growing area consists of some shelves in a dark corner of a room, artificial lighting can come to the rescue.

Light is essential for photosynthesis, the process whereby green plants use light energy to convert water and carbon dioxide to sugar and other carbohydrates. Plants utilize these products for food and to regulate physiological processes. Without ample light, photosynthesis and other biological processes are reduced or cease entirely.

Three properties of light are important to consider when choosing a primary or supplementary lighting system: quality, duration and intensity.

Quality refers to the color of the light emitted by a light source. The sun radiates light in all the colors of the rainbow. Plants need most of their light from red and blue areas of the color spectrum. Flowering plants need orange-red light in particular.

Duration, or photoperiodism, refers to the daily amount of light to which plants

are exposed. Plants are classified as short-day, long-day or day-neutral, depending on the photoperiod that they require. Most plants need 14 to 16 hours daily.

Intensity refers to the amount of light available in a given area. This is measured in footcandles (the light intensity of one candle at a distance of one foot). Of all the factors limiting photosynthesis, intensity is the most critical. Consider that outside on a sunny day, the light intensity is somewhere around 10,000 footcandles. The average indoor light level, on the other hand, is 50 to 150 footcandles.

Many different types of artificial light are available for indoor gardening. If you choose a light source that emits the full spectrum of light, your plants should thrive.

HIGH INTENSITY DISCHARGE (HID) LAMPS

High intensity discharge (HID) lamps are the most effective and brightest lights

ELVIN MCDONALD



Halide lamps provide the best spectrum of light for all stages of plant growth. They are also six times more energy efficient than incandescent bulbs and last a long time.

available. These bulbs create light by passing electricity through a sealed glass or ceramic tube. The two most common HID lamps are the halide and sodium types.

Halide lamps are the most popular source of white light available for indoor gardening, providing the best light spectrum for all stages of plant growth. Not only is the light emitted from halide lamps comfortable to work around, but plants also appear most aesthetically pleasing when viewed under white light. The bulbs produce light up to six times more efficiently than incandescent light sources. They also have a long life expectancy and are available in a wide range of wattages.

Sodium lamps are the brightest of the high intensity discharge lamps. They provide more light from the orange-red area of the light spectrum, the range that stimulates flowering in plants. Because the light from these bulbs has an orange-red cast, you may want to use them in an unfrequented area or in a greenhouse. Sodium bulbs are also available in a wide range of wattages and typically last longer than halide bulbs.

Halide bulbs are recommended for situations in which there is little or no natural light. Sodium lamps are best for supplementing natural light. A combination of a halide and a sodium bulb will not only increase light intensity but also provide a full spectrum of light enhanced in the red-orange range. Sodium conversion bulbs are available which can be interchanged with a halide bulb in a halide lighting system to boost flowering.

What wattage bulb do you need? This depends on the size of your growing area, the light needs of the plants you're growing and whether the artificial lighting will be the primary light source or a supplement to natural light. See "How Many Watts?"

HOW MANY WATTS?

Lamp Type	Wattage	Growth Area (sq. ft.)
HALIDE	175	9
	250	12
	400	25
	1,000	64
SODIUM	150	9
	250	12
	400	25
	1,000	64



The orange-red light of sodium lamps stimulates flowering.

for some general guidelines.

A light source will keep your plants productive only as long as the light intensity remains strong. It's a good idea to monitor light intensity periodically with an accurate light meter. When lamp intensity has decreased, replace the bulb. A good rule of thumb: both halide and sodium bulbs should be changed after 12 months of use.

BALLASTS AND REFLECTORS

Once you've chosen the kind of light source for a specific growing situation, it's time to consider the ballast, reflector and other components of the system. Be sure the lighting system passes Underwriters Laboratory (UL) standards. It should be recommended by UL as safe for use around water and in damp areas. It should also have a full-size junction box for wire connections, and 600-volt wiring from the lamp to the ballast.

The ballast (the power unit that regulates the flow of electricity) should be horizontally oriented. It will run 25 percent cooler and last longer than a vertically oriented ballast. A heavy-duty 14/3 grounded power cord is highly recommended for all systems. Most lighting systems are designed to run off standard household electrical currents.

Reflectors should be painted white to increase light efficiency. Plain, polished aluminum does not reflect evenly, creating hot spots in your growing area. A double parabola reflector design ensures that all the light from the lamp is directed toward the plants.

Previously, many kinds of artificial lights were available for indoor use. However, many of them have been proved unacceptable. Armed with the information above, you should be able to grow healthy houseplants even if you don't have an abundance of natural light.

Holistic Health Care for Houseplants

How to enhance your plants' ability to take care of themselves

BY DR. C. C. POWELL

Maintaining resistance to infections and infestations is a basic life process of any living thing, be it a human being or a houseplant. The things we do as caretakers of plants will be successful if they enhance the plants' ability to take care of themselves. This is basically what holistic or integrated health management is all about.

THE PLANT HEALTH BALANCE

What is a healthy plant? Good health involves a balance. If all of the environmental elements that are influencing a plant remain within reasonable ranges, a plant can balance its internal processes to satisfy its needs. It remains a healthy plant.

The basic environmental elements that promote houseplant health are: a crumbly soil, a balance of nutrients, proper soil pH, enough space for crown and roots, ample water, moderate temperatures, good light, pure air and freedom from pests and diseases. When one or more of these elements is out of kilter, the health of the plant is at risk. So the first order of business in keeping your houseplants healthy is to maintain the proper environment for each.

Stresses cause houseplant problems. When confronted with an unhealthy plant, your first job should be to identify chronic environmental imbalances rather than merely treating the acute problem such as an infectious disease or insect pest. Put yourself in the plant's place. Investigate the soil or water situation, whether there's too much light, whether temperatures are too high or too low, whether the soil is compacted.



The yellowing leaves of this Japanese fatsia could be a sign of nutrient deficiency. It could also be the result of inadequate drainage.

Remember that environmental imbalances are apt to occur in combinations and may compound one another. For instance, soil dryness may not become stressful until temperatures climb. If dryness and high temperatures persist, spider mites may begin to develop.

ACUTE VS. CHRONIC STRESS

Plants, like humans, suffer from acute and chronic stresses. The former occur suddenly and cause damage quickly. Improper sprays, toxic chemicals poured onto soils, injuries during shipment, transit or handling at home, or day-to-day exposure to extremes of cold and heat are examples of acute conditions. Plants become unhealthy very quickly as a result of these problems. Chronic conditions, on the other hand, include nutritional imbalances, soil compaction, soil moisture problems, not enough light or improper soil pH, which can tie up nutrients and make them unavailable to the plant. Chronic conditions take time to affect a plant.

Dealing with chronic conditions sometimes is easier than remedying acute conditions. If you recognize signs of chronic problems immediately, you can gradually reverse the imbalance. On the other hand, there's little time to correct an acute problem



C.C. POWELL

When faced with a plant stressed by insects or disease such as anthracnose, above, your first job should be to check for and correct environmental imbalances.

before disaster sets in. Usually, all you can do is learn from the experience and avoid repeating it.

Chronic conditions eventually result in sick plants. The time it takes for the plant to become sick is called the period of plant decline. There are varying degrees of plant health, ranging from magnificently healthy to pathetically diseased. The longer a plant endures a stress-promoting condition, the more drastically it declines in health. The key is to recognize problems early and act quickly to reverse them.

NONINFECTIOUS AND INFECTIOUS PROBLEMS

Chronic environmental conditions often weaken a plant, leaving it susceptible to infectious agents. Managing these conditions can go a long way toward solving infectious as well as noninfectious problems. Of course, this is not always the case. Some disease organisms (such as crown rot) or pests (such as mealy bugs) are so infectious that they will attack even reasonably healthy plants.

SOME COMMON INSECTS AND DISEASES OF INDOOR PLANTS

It's a good idea to become familiar with the most common houseplant pests. The serious ones are mites, mealy bugs and scale insects. All of these are relatively immobile; once they arrive on a plant, these pests and their immediate offspring tend to stay on it. Their numbers may increase or decrease from time to time, but the infestation remains. As plants are moved about, the pests ride along. Often they are on the underside of a leaf or some other place that makes them hard to find, or their numbers

may be so low that they go undetected. As long as you make sure the plant is not environmentally stressed, these pests cause no trouble. However, if environmental conditions change for the worse, the pests can rapidly multiply and spread to other plants.



Diseases such as powdery mildew, above, are often caused by improper watering, too much or too little light or temperatures that are too high or too low.

The outside agent causing an infectious disease is called a plant pathogen. Many bacteria, viruses, fungi and nematodes are plant pathogens. Most of them are microscopic and live on or in plant tissue as parasites. Their activities on or in the plant cause abnormalities that lead to disease symptoms. For instance, as a pathogen "robs" leaf cells of nutrients, it may also deposit enzymes or toxic waste products into the surrounding tissue. These substances may produce yellowing, malformation or death of plant cells and tissues. The destruction of one part of the plant can cause problems elsewhere. Root rot causes wilt and yellowing of shoots, for example, because rotted roots cannot take up water and essential nutrients.

Keep in mind that the pathogen and the disease are not the same thing. Diseases don't spread from plant to plant – *pathogens* do. Fungicides can't control diseases, they control or kill the fungus causing the disease. You will have a better appreciation of managing infectious diseases if you remember that it is the pathogen and not the symptom that you are trying to inhibit, eradicate or otherwise control. The most common infectious diseases of indoor plants are powdery mildews, leaf spots and root rots.

TEN TIPS

Holistic health management begins with plant selection and continues with proper care that will ensure your plants' environmental needs are being met. These two broad





C.C. POWELL

Insect pests from left to right: mealybugs, scale and red spider mites. The most effective pest-management strategy is prevention — closely examine plants you

strategies will prevent or control most pest and disease problems. If all else fails, you may need to discard a plant or else consider some stronger medicine. However, pesticides should be a last resort— they may eliminate the pest for the time being but do nothing to remedy the underlying environmental stresses that made the plant susceptible to the problem in the first place.

The following ten tips are designed to help keep your houseplants healthy.

1 Select plant species that are not overly prone to pests and diseases.

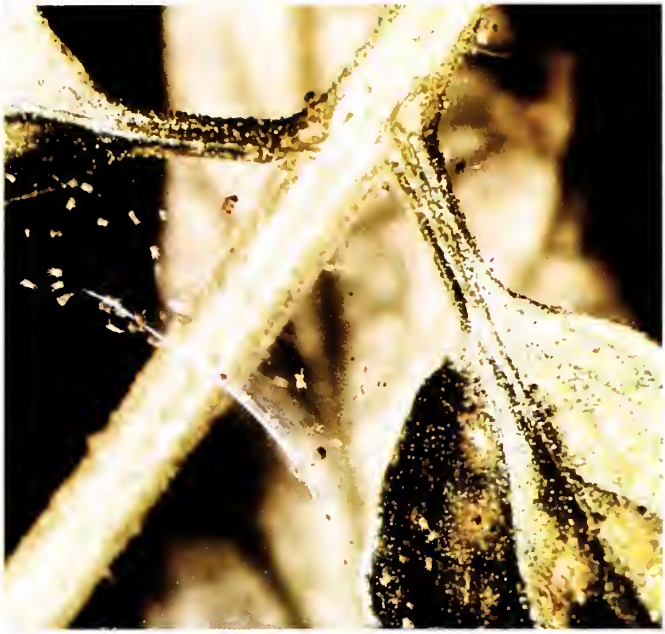
2 Be fussy about where you buy new plants. Some growers are more rigorous than others in their efforts to prevent and control pests. Many plant pests originate at the nursery or greenhouse. The most effective pest-management strategy is prevention — buy only pest-free plants.

3 Closely examine new plants. If possible, keep them quarantined for two to three weeks before introducing them to previously adopted houseplants.

4 Make sure that pests aren't brought in from outside by you or anyone else who comes into contact with outdoor plants. Many mites and insects are specially adapted to attaching themselves to clothing or skin.

5 Always work with clean hands and clean equipment. Periodically change, clean or disinfect all your gardening tools. Mites and insect pests are commonly spread





are considering buying. Purchase only pest-free plants. Select plant species or cultivars that are not overly prone to pests and diseases.

through contaminated equipment. Dusters, for example, can be fumigated in a box or bag with mothballs.

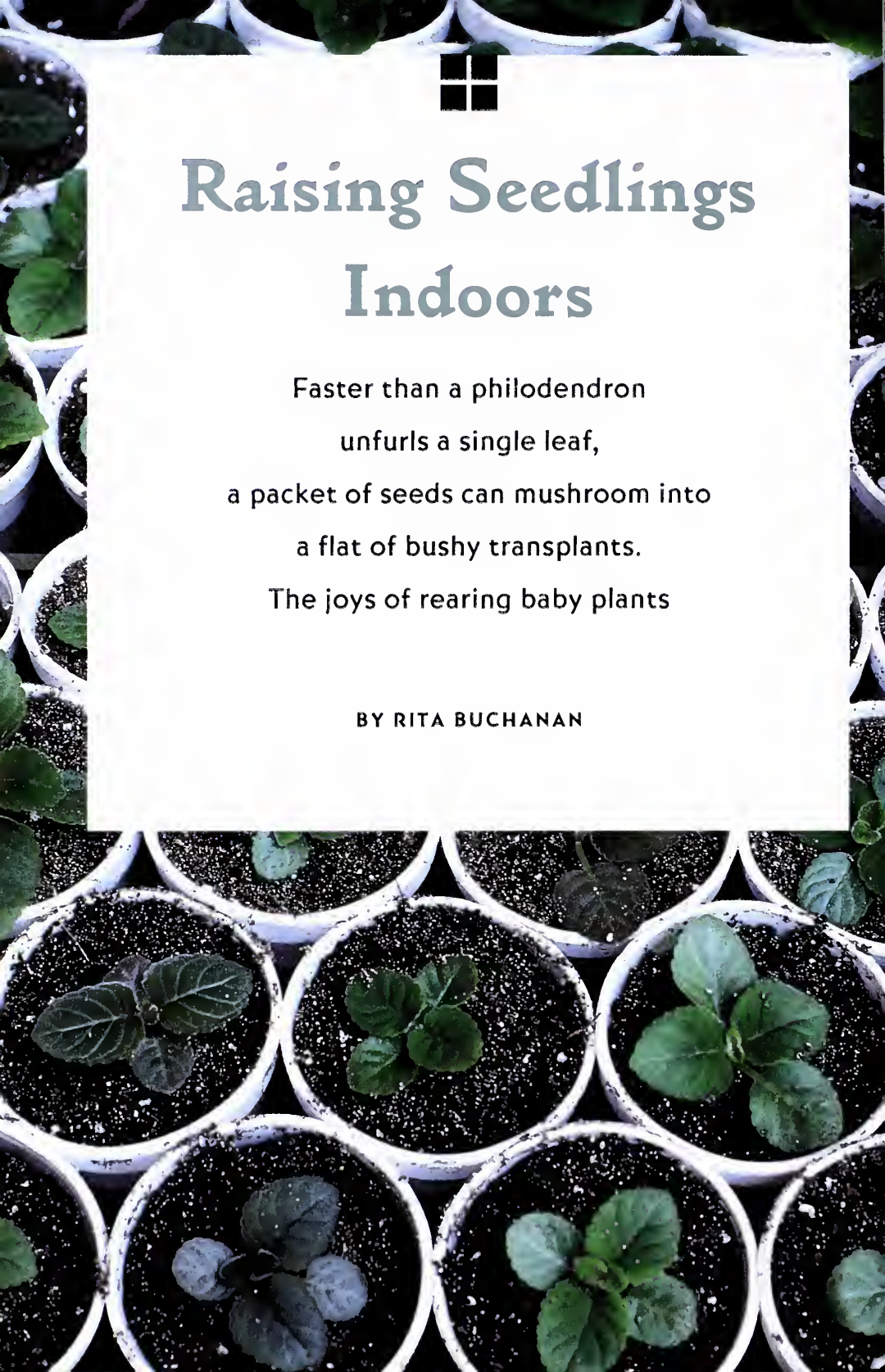
6 When watering, avoid touching plants with water breakers or hose extensions whenever possible. Avoid splashing water from plant to plant.

7 Isolate moderately and heavily infested plants. Dispose of them or treat them in quarantine. Sanitize all nearby surfaces after infested plants have been removed. Prune infested branches. Keep the plants quarantined for one month after the last treatment. Even then, inspect them carefully for hidden infestations and don't forget to check the roots.

8 Improve vigor of plants by improving root health: if the soil is compacted, loosen it up and add a bit of fresh soil, or repot if necessary. Increase the amount of light provided for the plant.

9 Increase humidity; avoid hot, dry areas. Lower fertilizer rates. Keep infested plants moderately moist at all times.

10 If you use pesticides, read and follow labels closely. If the name of the plant is not on the label, then it is probably inadvisable to use that product on your plant. Hose off as many of the pests as possible before spraying. Several applications of pesticide will probably be needed to control the problem.



Raising Seedlings Indoors

Faster than a philodendron
unfurls a single leaf,
a packet of seeds can mushroom into
a flat of bushy transplants.
The joys of rearing baby plants

BY RITA BUCHANAN



ouseplants, for all their charms, aren't very dynamic. They don't *do* much. By contrast, seedlings change and grow from day to day. First a tiny sprout peeks above the soil and spreads its flap-like cotyledons. Before long, the first true leaves develop, already displaying the characteristic shape and fragrance of the species. Roots poke out the bottom of the container, and soon it's time for repotting. Every time you look, there's something new to see. Faster than a philodendron unrolls a single leaf, a packet of seeds can mushroom into a flat of garden-ready transplants.

Raising seedlings is fun, and there are many good reasons to give it a try. By starting your own flowers and vegetables, you can get a headstart on the season, save money and try interesting varieties that you'd never find at a local garden center. If you don't have much space for a garden, you can start plants for windowboxes, hanging baskets or patio planters. You can even start your own houseplants. Many kinds grow readily from seed. Try gloxinias, gerbera daisies and geraniums for bright flowers; coleus and polka-dot plants for colorful foliage; eucalyptus or palms for a tropical effect.

Starting seeds indoors avoids such outdoor risks as heavy soil, cold nights, splashing rain, glaring sun, dry winds, hungry birds and errant dogs. You can virtually control the weather indoors, providing ideal conditions for tiny plants, and you can make their lives easy and safe. No doubt about it, starting plants indoors gets the highest yield from each packet of seeds.

PROVIDING IDEAL CONDITIONS

Providing sufficient light is very important. Even if there are no cloudy days where you live, day length is still short in late winter and early spring, when you most want to start seeds. The solution is to use fluorescent lights. Simple shop-light fixtures, available at any lumberyard, building-supply center or discount store for under $15, do the job nicely. Ordinary tubes are okay; you don't need special grow-lights for seedlings.

You'll need to support the lights somehow, and to adjust their position as the seedlings grow. Seed catalogs feature manufactured light stands that look very nice, but you can easily make your own from boards, plywood and a handful of nuts and bolts. Some gardeners hook chains from the ceiling to support lights over a table or bench; others simply balance the ends of the fixture on bricks or books.

A 24-hour timer that turns the lights on and off automatically is a worthwhile convenience. Seedlings grow fastest with about 18 hours of light daily, so you might set the lights to turn on at 6 a.m. and off at midnight.

As for temperature, most seedlings do fine if the air temperature is between 60 and 75° F in the daytime. Fluorescent lights don't give off much heat, so the temperature underneath them is about the same as the room temperature. However, it doesn't hurt to check regularly with a minimum/maximum recording thermometer, especially if the seedlings are in a room far from the thermostat.

Don't even think of using ordinary garden soil for starting seeds. It's too dense and heavy. Some gardeners swear by screened, finished compost, but professional horticulturists always use commercial seed-starting mixes made of finely ground peat moss and vermiculite. These mixes are sterile; that is, free of weed seeds and disease organisms. They're lightweight, even when wet, so they don't stress thin-walled plastic trays and flats. Both the peat moss and the vermiculite absorb and hold moisture readily, but extra water drains quickly through the large pore spaces. The fine, granular texture of the mix makes it possible to spread a very thin layer over newly sown seeds. It also facilitates teasing apart the roots during transplanting.

Seed mix is very dry when it comes out of the bag, and should be moistened before using. I put some in a plastic dishpan, add hot tap water and stir thoroughly, then wait several hours for the soil to absorb the water. When you use the soil, it should be moist but not so wet that you can mold it into lumps or squeeze out water.

SOWING AND GERMINATION

You can sow seeds in all kinds of containers ranging from recycled milk jugs and yogurt cups to wooden flats, soil blocks and styrofoam plug trays. Anything that's shallow and drains well will work. I use small plastic pots about two inches deep. One pot can hold up to a few dozen seedlings. Soon after germination, I transplant the seedlings into the separate cells of plastic six-packs. To save time, you might sow a few seeds directly into the six-pack cells, thinning them later.

The most important part of sowing is spacing the seeds far enough apart. Crowded seedlings grow tall and skinny with weak stems. Also, tightly jammed seedlings are hard to separate for transplanting. Unless the package states otherwise, assume that you'll have nearly 100 percent germination. Try to position the seeds on the soil surface at least four times as far apart as they are wide.

Seed germination is often affected by light. Only a few plants, including vincas and delphiniums, demand total darkness. Most tiny seeds, such as begonias, and many medium-sized seeds, including coleus and impatiens, germinate better if they're

exposed to some light (ordinary daylight inside a house is sufficient). Check the seed packet or catalog for more information on particular species. If no light requirement is specified, just spread a shallow layer of soil mix — about the thickness of the seeds themselves — over the surface of the pot.

Watering after sowing helps settle the seeds into place. The safest method is to set the pots in a shallow tray of water, letting the water wick up into the soil until the surface looks dark and shiny. Then set the pot aside to drain. A faster but riskier method is to apply a gentle spray with a mister.

Keep the seeds evenly moist until they germinate. A single drying-out can be fatal. The easiest way to maintain constant moisture is to put the pots into a plastic shoebox or sweaterbox, or cover the seedling flat with a sheet of glass or plastic. Thus protected, seeds will stay moist for weeks without additional watering.

RITA BUCHANAN



Providing enough light for seedlings is crucial. Days are short in late winter when you're most apt to start seeds. The solution is artificial light.

Some seeds prefer warm or cool conditions during germination. Again, check the packet or catalog for specific requirements. Most flowering annuals and tropical houseplants germinate best if the soil temperature is between 70 and 80° F; it doesn't matter if the air is cooler than that, as long as the soil is warm. You might have a suitably warm spot on a radiator or heat vent, or you can purchase electric soil-heating mats from garden centers. Look for one with a built-in thermostat.

Most commonly grown seeds germinate in less than a month, and many pop up in less than a week. Check each pot daily. If you spot any emerging shoots, remove the glass or plastic lid and take the pot off its heat source. Extra heat and humidity can weaken tiny seedlings. What they need now is bright light and circulating air.



RITA BUCHANAN

You can sow seeds in any kind of container, as long as it has good drainage.



RITA BUCHANAN

Starting in one corner, carefully prod the roots of tiny seedlings free using a pencil.

CARING FOR SEEDLINGS

Seedlings become "leggy" if they don't get enough light. As soon as they emerge, position seedlings within two to three inches of the light tubes. As they grow taller, keep adjusting the pots and lights so the bulbs are just two to six inches above the leaves. The stems will stretch and grow weak if they are too far from the lights.

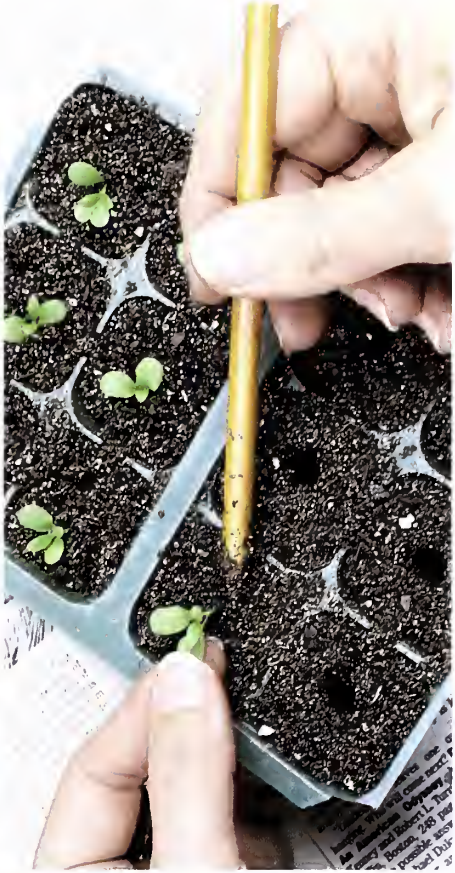
Careful watering is a necessity for seedlings, especially at the early stages. Some pots will need watering every few days, others require drinks less than once a week — it all depends on the kind of plant, how many there are in the pot, and how big they are. Check each pot daily; if it feels lightweight and the soil surface is light colored, it's time to water. A good watering method is to fill a shallow bowl with tepid water and lower the pot in the bowl to absorb water from the bottom up. A few seconds dip will saturate the soil. Another way to provide water is with a layer of capillary matting, a puffy synthetic-fiber fabric. Cut a piece of matting to fit under the pots of seedlings. Thoroughly wetted, it can absorb enough water to keep moistening the soil for a week or more.

Bottom watering is good for the roots; they grow deeper and stronger if the soil is drier on top and moister beneath. Also, keeping the surface of the soil dry helps protect the stems from"damping off," a fungal disease that attacks the stem tissue right at the soil line, so that the seedlings flop over and die. To prevent the problem, sow the seeds far enough apart to allow air to circulate between the young plants.



RITA BUCHANAN

To give them growing room, transplant seedlings into a new container. Plastic six-packs can be reused.



RITA BUCHANAN

Set seedlings slightly deeper than they were in the germination pot to keep them from flopping over.

As soon as seedlings have two or more true leaves, they benefit from frequent applications of diluted fertilizer. I use a soluble houseplant fertilizer such as 20-20-20 or 15-30-15 once a week, mixing about 1/4 tsp. per gallon of water. Manure tea, fish emulsion or seaweed extract also work well. Whatever you use, regular feeding promotes steady, vigorous growth.

Pests can be a problem. You can kill pests with a light spray of pyrethrum, insecticidal soap or highly refined horticultural oil. But be careful — any of these remedies can scorch the seedlings' leaves. Try dislodging the pests with a spray of plain water before escalating to anything stronger.

TRANSPLANTING SEEDLINGS

A few weeks after germination, when the seedlings have grown two or more true leaves (cotyledons don't count), it's time to transplant. Freeing a seedling from its neighbors requires careful handling. Always grasp a seedling by a leaf, not its stem — it can survive injury to a leaf, but a snapped stem is fatal.

For tiny seedlings such as petunias or thyme, start at one edge of the seedling pot and try lifting them out one at a time, using a pencil to prod the roots free. For tomatoes, peppers, zinnias and other vigorous seedlings, you'll do less damage to the roots if you tip the pot and carefully slide the whole soil ball out onto your work surface, then untangle each plant from its neighbors.

It's tempting to pot up every single seedling that germinates, but consider the consequences. Plants take up space. How many of those plants do you really need or want? Could you give away the extras? Decide at the onset how many seedlings should be saved, then choose the sturdiest ones for transplanting and discard the rest. That's the hardest part of raising seedlings.

You can transplant seedlings into all sorts of containers. I prefer pre-formed plastic six-packs. They're inexpensive, easy to sterilize for reuse (wash them in hot soapy water with a dash of bleach) and compact enough to store from year to year. They fit securely into plastic flats that are convenient for bottom-watering and for transport. Best of all, even heavily rooted transplants slide out of the cells easily with minimal trauma.

Whatever type of container you use, its size should match the size of the plant and its rate of growth. Tiny or slow plants need small pots; more robust plants can go in larger pots. When in doubt, choose a smaller-size pot.

There are two methods of transplanting. If the root system is large, or the roots are thick and brittle, hold the plant with one hand, suspend the roots in the center of an empty pot, scoop in some soil with your other hand, fill the pot to the rim and gently tamp it down. If the root system is small, or the roots are thin and fibrous, fill the pot first with loose soil, make a hole in the middle with a pencil or your finger, drop the roots into the hole, then push back the soil and tamp it into place. Never coil the roots as you transplant a seedling. Once they start growing around in circles, they never branch out properly.

I usually set a seedling deeper than it was in the germination pot, placing the cotyledons just above the soil surface. Setting the seedlings deep helps hold them in an upright position, so they don't flop over. There are exceptions: seedlings of sweet peas, lilies, grasses and other plants whose cotyledons remain below the soil surface should be replanted at the same depth as they were before.

GROWING ON

After germination, it usually takes 4 to 12 weeks for seedlings to grow big enough to transplant into a garden bed, planter or adult-size pot. Their primary needs during this time are plenty of light, careful watering and regular feeding. Keep adjusting the lights so they are just a few inches above the leaves. Group like-sized seedlings together to facilitate your light adjustments and check seedlings daily for watering.

Many seedlings benefit from being "pinched back"— that is, pruning out the growing tip to encourage side shoots to develop. Short, bushy plants are always stronger and more attractive than tall, skinny ones. At the same time, pinch off any flower buds that appear. Young seedlings shouldn't be wasting energy on making flowers; that can wait until after their roots and shoots are well developed.


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Expose young plants to the outdoors gradually over several days before planting them in the garden.

Seedlings that are destined for the garden need time to adjust from the protected environment indoors to the real world outdoors. Allow several days for the transition, a process called hardening off. The idea is to expose them gradually to hotter and colder temperatures, bright sun, drying winds and overhead watering. At first, set them out for only an hour or so in the morning or afternoon. Then leave them out all day, and finally leave them out day and night.

Even seedlings of houseplants such as geraniums may need time to adjust when they graduate from the lightstand to the windowsill. A sunny windowsill can get hot enough to wilt tender young plants, so it's a good idea to move them back and forth between lights and window for a few days. Of course, you could keep growing them under the lights indefinitely. But then you'd have to get more lights so you could raise more seedlings again someday.

Hydroponics & Hydroculture

A beginner's guide

BY JOELLE STEELE

To some of us, growing a plant without good old-fashioned "dirt" seems unnatural. We're so accustomed to seeing plants growing in soil that we assume they cannot grow properly without it. But plants do not require soil. In fact, plants grown in water alone (hydroculture) or in hydroponic systems (containers or units filled with water and such non-soil media as crushed rock or vermiculite) are often healthier than their soil-grown counterparts.

Hydroponics offers many benefits to gardeners. The sterile medium eliminates soil-borne pests and diseases as well as weeds, drastically reducing the need for toxic chemical controls. Lack of humidity is no longer a concern as the water supply provides atmospheric moisture.

Hydroponic gardening takes the guesswork out of watering and fertilization. Exact amounts of nutrients are given at specific intervals, and the plants use them as needed. Nothing is leached out of the root system, the roots do not grow as extensively in water as in soil and the plants make at least 20 percent more crown growth. They also take up less room and can be grown in individual pots and containers of whatever size, shape or configuration the available space dictates.

For beginners, basic hydroculture or water culture is an inexpensive introduction to this gardening method. One or two plants (of the same or different species) are displayed in containers filled with water and nutrient solutions. More advanced hydroponic systems may contain supportive materials such as charcoal and gravel.

CONTAINERS

For true water culture, almost any heavyweight, clear glass container of any shape or configuration may be used. For plants that require more support than water alone can provide, a layer of crushed rock in the bottom of the container will give the roots a foothold. Charcoal from your aquarium supplier can be used and has the added advantage of deterring the growth of algae, a harmless but unsightly green growth that sometimes covers the inside of the glass container, particularly if it is in a warm, sunny window.

Containers and any support media must be thoroughly sterilized before you introduce plants and water. Scrubbing with hot soapy water should do the trick. If you decide to grow a mature plant in water rather than rooting a cutting, you must also remove all traces of soil from the plant. Then place it into the container and slowly pour the water around the roots until part of the stem is underwater. If the leaves get wet in the process, be sure to blot them dry with a soft cotton towel.

WATER QUALITY

Because the purity of the water is important, it must be replaced at least once every four weeks. If algae form between changes, the container must be scrubbed out and all traces of the algae must be removed before the water is replaced. To help cut down on algae, reduce the amount of fertilizer you use. And, whenever the water level drops between monthly changings, add a little more water.

Water pH is also important. To measure the pH of the water, you will need a pH testing kit consisting of nitrazine paper strips. Check the water weekly. A pH reading between 6 and 7 is ideal. When the pH is not within these limits, the plant may not be able to use the available nutrients. If the water is too alkaline, (over 7), neutralize it by adding drops of vinegar or grains of aspirin, retesting after each drop or grain until the proper level is reached. Though it is not common, water that is too acidic (under 6) can be neutralized by adding bicarbonate of soda.

Chlorinated water affects pH levels, so let the water stand for 48 hours until this chemical dissipates before filling your containers. Never use artificially softened water. And if you decide to use a hydroponic system that collects drained-off water and nutrient solution, it should be reused only for a short period of time — three to four days at most.

NUTRITION

With hydroponic systems, almost any plant food can be used as long as it is water soluble. In addition, the manufacturer's package should state that it is a "complete fertilizer" specifically formulated for the types of plants you are growing. Reduce the

amount recommended by about one third for use in hydroponic and hydroculture systems. The only time to fertilize is each time the water is changed. Fertilizers specifically formulated for hydroculture are available.

GROOMING

Plants grown in hydroponic systems do not require a lot of care, but they do get dusty and should be cleaned regularly so their pores do not become clogged. Remove any dead leaves from the plant or the surface of the media. Those dead leaves can decay and "pollute" your otherwise sterile system.

DIFFERENT METHODS

A variety of hydroculture and hydroponic methods are readily available in this country:

Continuous Flow Method involves three containers arranged at different levels



STEVE BUCHANAN

Hydroponic systems range from the simple to the high-tech. This relatively elaborate set-up has a built-in timer and pump.

with the highest containing nutrient solution with a tube leading to the middle container where the plant is located. Another piece of tubing runs from the bottom of the middle container to the lowest container. As the top container empties, it is refilled from the bottom one, recycling the water and nutrients. This is a workable system but may not be practical as it also requires aerating the solution with oxygen.

Gericke Method uses waterproof troughs topped by a wire grid with a mixture of peat and hay (or sawdust). The plants are stabilized in the media so their roots grow through the grid and into the nutrient solution below with a space for oxygen left between the grid and the liquid.

Other methods use traditional pots filled with substances other than soil.

Sand Culture consists of a pot filled with sand and water. But the sand usually becomes waterlogged unless it's mixed with gravel for improved drainage.

Aggregate Culture employs gravel, perlite, vermiculite and wood chips. Gravel or vermiculite is used in combination with sand for water retention, and the amount of sand used is determined by the frequency of watering. The less often you want to water, the more sand you use. This method requires some experimentation to discover the right combination of materials.

STEVE BUCHANAN



The simplest system is a plant growing in water.

Flower Pot Hydroponic System relies on a variety of watering methods. Those systems in which water is passed through a growing medium and into a drainage reservoir are called "active" and those that rely on wicks or sub-irrigation are termed "passive." Automated sub-irrigation or wicks operate by means of capillary action to draw moisture to the root system from a reservoir. The gravity feed method consists of a bucket reservoir that feeds nutrients directly to the aggregate via a hose. The "slop method" has a pump that floods the surface of the medium with water, which seeps into the root system and exits through a drain into a container from which water and nutrient solution can be reused for a short time.

It takes some experimentation to determine which system you want to use. Budget is certainly one consideration, as are available space and the quantity and kinds of plants you want to grow.

Hybridizing Cane Begonias

True fanatics can never get enough of their favorite plant family. When you run out of plants to buy, hybridize. A beginner's guide to crossing plants

BY WALTER DWORKIN

Once you're smitten with a specific plant family, you can never get enough of it. These were exact sentiments when I fell for cane (also known as angel wing) begonias. Cane begonias are ravishing plants, with a wide range of different foliage shapes, colors and sizes as well as beautiful pendulous flower clusters.

Even after I collected virtually every plant in circulation, I still craved more. One thing leads to another, and I started to research the parental backgrounds of these plants. In no time I was obsessed with creating my own hybrids.

A hybrid is the result of crossing two plants of different varieties, species or genera. The first lesson to learn before attempting hybridiziation is that begonias have both female (seed parent) and male (pollen parent) flowers. Once you choose the parents for your cross (hybrid), you must take certain precautions.

VIVE LA DIFFÉRANCE

Let's begin by exploring the characteristics of the male blossom. The male bloom is easily recognized because, unlike the female, it has no ovary compartment behind its tepals

(petals). The pollen is stored in pollen sacks of the anthers of the male blossom. In many instances, although pollen is present, it's not always visible to the naked eye.

When you decide to make your cross, choose a day that is dry with low humidity. (If it's a wet or humid day, the pollen will not transfer to the female flower.) Likewise, avoid making crosses early in the morning if you live in areas where there is heavy morning dew. Newly opened male blossoms are not mature enough to release pollen. The best males are mature, with fully opened tepals, and preferably ripe pollen exhibiting a darker shade of yellow. One good rule of thumb is to use male flowers that have fallen off the plant because their pollen sacks have definitely matured. Pollen can also be stored in the refrigerator or frozen for use at a later date.

Now that we are all experts on pollen, let's examine the role of the female blossom in hybridizing. The female flowers generally appear in clusters after the males have opened. They are generally larger than the males due to the triple-segmented ovary compartment located behind their tepals. Once mature, the female will begin to open its tepals to receive pollen. I begin to pollinate the female flower as soon as it opens and continue for the next couple of days. Early pollination is my only insurance against alien pollen (spread by bees, other insects or the wind) gaining entry.

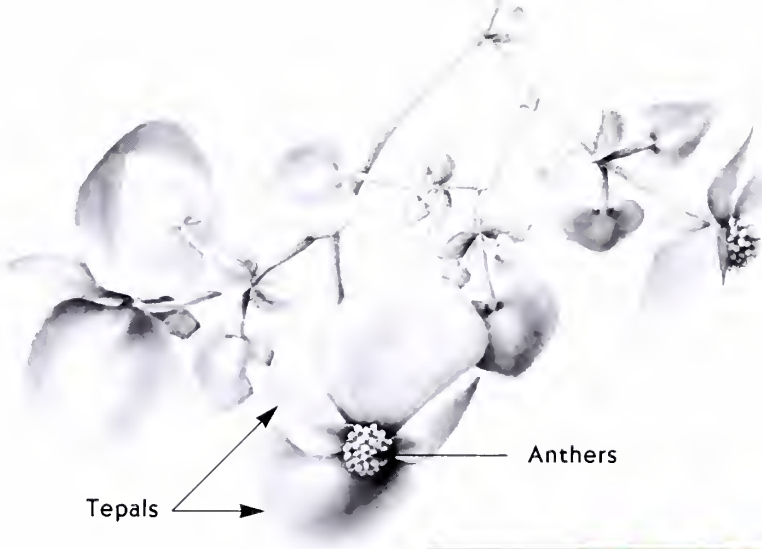
TAKING PRECAUTIONS

To pollinate the female blossom, simply take the male blossom and gently rub its pollen sacks into the female's stigma. Be careful not to damage the female's reproductive parts. Then tag the female bloom and carefully document in a diary the date of the cross and the parentage, always listing the female parent first and the male second.


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Transferring pollen

If the cross is successful and fertilization has occurred, the female will close its tepals and no longer be receptive to pollen. You will also notice discoloration of the female's stigma, shedding of the tepals and swelling of the ovary compartment. Once fertilization has occurred, you must wait at least five weeks to two months (praying all the while that your seed pod does not drop off). During this time, do everything in your power to protect the seed pod from damage by wind, rain, hoses and well-meaning plant-grooming friends. Once the pod has turned brown and its stem has shriveled to a threadlike state, it's time to harvest and place it in a labeled envelope until planting time.



STEVE BUCHANAN



TOVAH MARTIN

Above and right: male flowers of the honeysuckle begonia.

Seed pods that have been aged and dried properly can be turned upside down and the seed contents will come pouring out as from a salt shaker. If the seed doesn't spill out naturally, you can break the pod and sift the seed. Your harvested seed will be very minute, resembling pepper. If you lift and slant the paper in which your seed is resting, you will notice that the seed will start to roll — viable begonia seed is round.

AS YE SOW...

Sow your seed in a well-drained, sterile, soilless planting medium. The medium should be moist, but not soaking wet. Gently sprinkle seed evenly on top of the planting medium (begonia seed should not be buried). Next, spray the surface with a fine mist and wrap pot and all in a clear plastic bag. Keep your newly potted seed warm and covered in plastic to hasten germination. Most of the seed will germinate within 13 days; however, many seeds will sprout in as early as eight days, while others may take as long as two months. Once your seed has germinated, supply as much light as possible; good light will ensure compact, strong growth.

STEVE BUCHANAN



TOVAH MARTIN



Above: female flowers. In the photo, left, a female flower cluster is on the left and a male cluster is on the right.

During their developmental stages, two or three months, your seedlings will have a built-in immunity to mildew. Alas, this little blessing will be short-lived and you must examine the flat on a regular basis to check for signs of this killer disease. To keep your seedlings healthy, avoid overcrowded conditions and provide good air circulation. Better yet, when choosing parents for hybridizing, avoid those that are prone to mildew.

As the months pass by you'll feel like a proud parent watching your little treasures mature and exhibit a variety of beautiful colors, spots, stripes and leaf shapes. You'll find yourself on the telephone boasting that your hybrids are the greatest thing since sliced bread. I suggest that you refrain from making such telephone calls for about 24 months while your seedlings undergo some drastic changes. Today's pick of the litter could become tomorrow's dog.

The lot of the hybridizer is a mixed bag of rewards and disappointments, but in my experience the joy of success outweighs the heartbreaks. Every hybridizer rejoices when that special seedling inherits the best characteristics of both its parents, dazzling the world with its beauty.



Bulbs Indoors

The perfect solution for houseplant hedonists who want lots of pleasure for relatively little work

BY KATHERINE WHITESIDE

People have placed flowers in their houses for eons, but the idea of growing plants inside is a relatively recent notion, one that the ever-industrious Victorians elevated to yet another edifying art. The plants they started with were bulbs, "a few squat ugly bulbs that worked magic when planted," to quote *Once Upon a Windowsill*, a lively history of indoor gardening. After all, Victorian houses were cold, dark and often filled with coal smoke, so it was most fortuitous that bulbs — just about the most fool-proof bloomers around — were the first plants to undergo parlor cultivation.

Today, many busy, globe-trotting householders claim that they no longer have time for houseplants. And yet, there is nothing simpler than the annual pot of "forced" winter-blooming bulbs. Cheery crocuses, tulips or daffodils are the traditional choices for chasing away the cold-weather doldrums, but there are also many other accommodating candidates. Some of the most exotic-sounding and beautiful tender bulbs are truly indefatigable bloomers. And like all bulbs, they possess the most accommodating characteristic of slipping into a dormant period during which they need absolutely no attention at all. Bulbs are perfect for houseplant hedonists who want lots of pleasure for relatively little work.

'Tete-a-tete' daffodils mingle with striped squill, *Puschkinia scilloides*, in a rustic aggregate container indoors.

WHAT IS A BULB?

Hortus Third, the Big Brown Bible of North American gardeners, decrees that, "When defined as a horticultural class, bulbs are ornamental, partial-season, mostly simple-stemmed plants arising from bulbs, corms, tubers or thickened rhizomes." Thus, the mighty *Chasmanthe* that charges upward from a small corm is just as much a bulb as the familiar tulip. Likewise, the stately calla lily that arises from a thickened rhizome and the tiny tubers of *Oxalis versicolor* that unfurl dainty peppermint parasols fall into the catch-all category of bulbs.

GROWING HARDY BULBS INDOORS

The term "hardy" is so loose that it rattles. Plants considered to be hardy in the British Isles often won't survive two minutes during a New England winter. For our purposes here, we will relegate bulbous plants that thrive outdoors after a normally cold winter (temperatures often below freezing) to the hardy bulb group. This would include most tulips, narcissi, crocuses, alliums, fritillaries, muscaris and so on. Many of these plants are the most familiar bulbs for indoor use. But be forewarned that not *all* hardy bulbs work well inside. Professionals recommend that beginners try hardy bulbs that are relatively early-season bloomers with stems on the shortish side, and most gardening catalogs mention whether or not a bulb is suitable for forcing. However, once you get the hang of the simple routines required for flowering, feel free to try forcing any hardy bulb that catches your fancy.

For ordinary garden use, hardy bulbs are usually planted outdoors in autumn because they require a long cool period of very active root growth. A strong root structure must be developed before the top leaves and flowers can grow. Thus, it also makes sense to provide this root-growing period when you grow hardy bulbs indoors. Commercial growers have devised very exact time and temperature schedules to produce pots of flowering bulbs at precise marketing times. Household growers can relax a bit and enjoy the process.

In autumn, pot bulbs such as early tulips, narcissi, hyacinths, muscaris and crocuses in new, store-bought bulb potting mixture. Alternatively, you can make your own potting concoction by mixing the following in equal parts: good garden soil, leaf mold, well-rotted manure and sharp sand. The best looking containers are clay pots (with good drainage holes), which should be soaked in water for several hours before being filled with soil. The bulbs may be planted closely but should not touch one another. The top of the bulb should be even with the rim of the pot and, with tulips, the flat side of the bulb should face the outside of the pot. Don't mix different bulbs in the same pot

— they rarely bloom simultaneously.

Once you've made up all your pots, water well and promise faithfully that you won't let these bulbs dry out during their rooting time. Next, take all the pots to your dark, unheated basement, garage, attic or outdoor cold frame — in other words, stash them in a spot that will not reach over 48° F for at least the next two months, but one where the pots will not freeze and thaw. A word of caution: tulips and crocuses are especially yummy to animals who will eagerly dig up all your best efforts. Liberally sprinkling red pepper has proven a wildly successful deterent.



JUDY WHITE

Parrot tulips are a medium height and can be forced to bloom indoors.

If you potted your bulbs in early October, start checking their progress in early December. The best way to ascertain adequate root growth is to carefully remove the soil from around one of the bulbs and peek underneath. If you see roots, re-cover the bulb and leave this pot in place to settle down after your excavations. Choose another pot, or two or four, to bring inside for the next stage of forcing, keeping in mind that if you bring in new pots every two weeks, you'll have successive waves of indoor flowers for a long period of time. On the other hand, if your careful digging revealed little or no root growth, leave all the pots in the cold and check again in another two weeks.

Following their cold, dark rooting period, the ideal position for forcing hardy bulbs is in a window that gets as much light as possible but remains cool. Remember that hardy bulbs bloom outside when it's still sweater weather — you will have the best and most long-lasting flowers if you can find a sunny window that stays around (preferably under) 55° F. Once you've brought the pots inside, they will usually sprout leaves and flower in about three to four weeks. At flowering time, you may place your beautiful plants wherever you please, but keep in mind that cooler is better. A position of honor on the mantle — with a cheery fire glowing underneath — will soon reduce your weeks of waiting to a one-night burst of glory.

Most forceable bulbs can be purchased from dealers who will give more specific directions for each type. Some of the easiest and prettiest hardy bulbs for indoor win-

ter forcing are: crocus, chionodoxa, muscari, *Fritillaria meleagris*, lily-of-the-valley, *Scilla siberica*, snowdrop, hyacinth, tulip, narcissus and *Iris reticulata*.

Although there are exceptions, it's generally difficult to force the same pot of hardy bulbs year after year. Bulbous plants require a ripening period for many, often unlovely, weeks to build up their underground storage tanks for next year's growth spurt. Months and months of floppy, elongated and yellowing foliage are really not worth the few dollars you'll keep by attempting to save your bulbs for another season. After you've enjoyed your winter bulbs, just throw them away.

TENDER BULBS INDOORS

To many inexperienced indoor gardeners, the thought of growing tender bulbs seems pure folly – a difficult and expensive venture doomed to fail. However, if the truth be known, tender bulbs are actually easier to cultivate than hardy ones because they don't need a dark, cool preliminary rooting period. They grow roots and tops at the same time. Also, for the soft-hearted or penny-pinching, many tender bulbs can be saved year after year – they actually flower better after several years' cultivation.

Three South African plants – tall, swordlike *Chasmanthe aethiopica*, the graceful white calla (*Zantedeschia aethiopica*) and the dainty *Melasphaerula ramosa* – are so alike in their cultural needs that they can easily be mentioned in the same breath. Since they all come from the southern hemisphere, their natural flowering time is our winter. Thus we don't really force these bulbs, we just give them a hospitable position in which to carry on their normal blooming season. Corms and rhizomes of these plants are available in mid-summer and should be planted immediately. Chasmanthes and callas need large pots, melasphaerulas prefer a small pot. Potting soil is the same as the medium recommended for hardy bulbs, but these long-lasting bulbs should be buried at least one inch deep, leaving room in the pot for later top-dressings of compost. Do not water the pots at all at this time and, if possible, place them outdoors where they can bake in the sun but remain completely dry. Sometime in autumn, check your pots – green shoots should begin appearing. Bring the pots indoors, place them in a sunny window and give them water – southern hemisphere spring has started.

Water is important now. Chasmanthes and melasphaerulas need frequent watering, but should never get soggy. Although it's seldom recommended by modern bulb books, best results with callas come when the entire pot is kept standing in a bowl filled with water. (The Victorians recognized the aquatic nature of the calla and grew it in water with great success.) Bulb expert Martyn Rix recommends high potash feeds such as Tomorite, but watering with fish emulsion and top dressing with com-

post also promotes strong, healthy plants.

After several months of producing beautiful leaves, your South African pets will begin to bloom. *Melasphaerula* swings wiry wands with up to ten small, irislike white flowers per stem. *Chasmanthe* shoots up tall stems of yellow or red hooded "flowers" (technically inflorescences), sometimes sending stems as high as four feet. The calla unrolls "flower" after "flower" resembling white vellum. Your southern hemisphere flower show will last for weeks.

After flowering is finally over, the foliage will begin to decline. Allow the leaves to ripen (these never seem to reach the unbearably unsightly stage), then cut everything off at soil level. You are now back to the stage where you began, except, after a season's growth, the soil should be compacted enough so you can place the pots on their side in some out-of-the-way place in your garden. Let them bake dry all summer, and in autumn, begin checking for the sprouts that signal a new cycle of growth.


JUDY WHITE

Tender bulbs like glads are even easier to grow indoors than hardy bulbs.

There are many tender bulbs suitable for indoor growing. Some additional ones to try are: *Agapanthus, Amaryllis, Crinum, Gladiolus, Clivia, Oxalis, Nerine, Lachenalia, Ixia, Moraea* and *Gloxinia*. All these bulbs are readily available from catalogs and specific instructions for each plant are available from suppliers.

Keep in mind that indoor bulb growing is not limited to the ways and means mentioned above. Water-forcing is a pleasurable and simple method and is especially suitable for certain narcissi, crocuses and hyacinths. Basic instructions are: place pebbles one inch deep in a shallow bowl; position the bulbs on top and add a few pebbles around the sides of the bulbs to steady them; add water to the bottom of the bulbs; and place them in a sunny window. Keep the water topped up, but do not allow the bulbs to rot. Leaves and flowers will soon sprout.

Of course, there are also bulbous plants that may be grown indoors during the other three seasons. However, to many, the joy of growing bulbs indoors comes from the pleasure of easily having out-of-season flowers to cheer up our wintery houses.

Little Wonders for Small Spaces

Horticulture in miniature
is a concept rife with possibilities.
How to grow plants so small you may need a magnifying
glass to fully appreciate their beauty

BY ELVIN MCDONALD

Gardeners who grow houseplants have an unusual opportunity to admire at close range plants so small that a magnifying glass may be needed to fully appreciate their beauty. Miniatures save space, making it possible to grow many different varieties in a given area. Some miniatures are ideally suited to growing in individual small pots, from the size of a thimble up to an inch or two, while others may succeed better if set in a larger container. The pitfall is that tiny pots can dry out before you've scarcely turned your back. To apply water, purists use miniature watering cans, and they perform their pruning chores with delicate manicure scissors rather than the loppers wielded in the big garden outdoors.

Horticulture in miniature is a concept rife with possibilities. Instead of a row of sill specimens in soldierlike procession, try working them into a trayscape garden either casual or formal in design, inspired by Eastern or Western notions about gardens. The study of bonsai is an ideal way to learn about all aspects of miniature horticulture. The individual plant specimens can be variously trained as trees, shrubs,



ELVIN MCDONALD

Rebecca Tyson Northen, the doyenne of orchids, inspects the flowers of a miniature specimen.

vines or ground covers. Some are suited to becoming miniature tree-form standards, espaliers or topiaries.

The plants below are old standbys that have given me wondrous houseplant experiences for 30 years; others are new to my collection.

Acalypha godseffiana 'Heterophylla' is native to New Guinea, a close relative of the famed "chenille plant," and a nonstop producer of tiny, tufted "chenilles" But the main attraction is the narrow skeleton leaves colored bronze, copper, cream, green and yellow on thin vertical stems that top out at 12 inches in height. This tropical will defoliate if subjected to temperatures below 40° F. Provide sun or partial sun.

Bougainvillea 'Pink Pixie' is a fraction of the size of regular bougainvilleas. Shell-pink bracts and pink flowers appear all along the stems between the very small leaves. It grows to about 12 inches in height. Needs full sun.

Ceropegia woodii, the rosary vine, is ideal for a six-inch wreath set upright in a three-inch clay pot. It can also be used in grander designs — as an arbor or pergola in a miniature landscape, for example. Provide full sun or partial shade.



ELVIN MCDONALD

Cyrtanthus species and hybrids look like miniature hippeastrums. They come in luscious pastels, bloom over an extended period and can be readily grown in a sunny apartment. The permanent collection of living plants at the Brooklyn Botanic Garden has some of the loveliest cyrtanthuses in cultivation.

Gardenia jasminoides 'Prostrata Variegata' is a perfect replica in miniature of a regular gardenia with little leaves with creamy white margins. Appropriately small flowers open intermittently all year and smell divinely of gardenia.

Hippeastrum, amaryllis, often earns its keep by being large. However, collectors crave the smaller species. The late Marcia Clint Wilson of Texas was an early champion of smaller, evergreen, repeat-blooming amaryllis. She gave me a bright pink blooming amaryllis with a green star in the throat and a citron yellow miniature that I have cherished for nearly 20 years, long enough to lose the name tags. Marcia's collection now resides with Steve Lowe, horticulturist at the zoo in San Antonio, who has continued her work. The commercially available 'Scarlet Baby' from the Netherlands is a good plant with which to start your collection.

Hoya lanceolata ssp. *bella* 'Variegata' is a summer-blooming form of the dwarf bush wax flower with short, trailing stems hidden beneath thick, waxy, lime-green leaves, each with a distinct dark green margin. It can cascade from a small basket or be



ELVIN MCDONALD

Angel wing begonia 'Tiny Gem', opposite page. Diminutive plants in tiny pots like this dry out quickly. Purists apply water with miniature watering cans. At left is *Crassula lycopodioides pseudolycopodioides*.

coaxed up and around a six- to eight-inch circle to form a living wreath.

Impatiens 'Hawaiian Pink' and 'Hawaiian Scarlet' resemble the common bedding impatiens, but in miniature. This three-inch impatiens smothered with bloom could come in handy as an edger or ground cover in a tiny garden or flower show exhibit.

Nematanthus wettsteinii, the miniature goldfish plant, is an extra-small version of a gesneriad that has small, waxy leaves and orange pouch flowers in profusion. It can be accommodated in a three-inch hanging basket with stems cascading down six inches, or the pliable stems can be trained into a four- or five-inch wreath.

Porphyrocoma pohliana is a miniature member of the acanthus family from South America. A rooted cutting in a two-inch-square pot will grow hardly more than four inches tall in a year. The persistent foliage is silver with burgundy underneath, while each stem is topped by a long-lasting ruby bract holding purplish flowers resembling sage blooms. Provide half sun to half shade.

Rosa, the rose genus, includes an array of micro-miniatures and minis, bushes, trailers and climbers. They look adorable in a sunny, airy window, or in a fluorescent-light garden (you'll need at least four 40-watt tubes in a reflector six to ten inches above the tops of the rose plants with an oscillating fan to keep the air moving). Try



ELVIN MCDONALD

training a micro-miniature into a diminutive tree-form standard six inches tall in a three inch pot. Train a dozen or more as an alleé in a very small formal garden indoors.

Miniature African violets or *Saintpaulia* have made it big time on the strength of being cute and nearly self-reliant. In the system developed by the Holtkamp family, each flowering violet has its own clear plastic reservoir filled with enough water and nutrients to keep it going for at least a couple of weeks. Optimara Violet Food, NPK 14-12-14, is the product designed to make this system work, along with average room temperatures and light bright enough to read by. There are many other miniatures, including micro-minis and trailers. Like their large-size ancestors, they have a tendency to produce clusters of small leaves at the base of the plant ("suckers"), and they fail to flower if the soil becomes too dry between waterings.

Serissa foetida 'Floro Pleno', the snow rose, is a gardenia relative that has tiny leaves like boxwood and double white flowers resembling tiny gardenias or minute white roses. It is highly trainable as a bonsai or tree-form standard and does well in a bright window or under fluorescent light. There are several cultivars, some with variegated leaves, others with single or pinkish flowers.

Sinningia 'Tinkerbells' was bred by the late Elena Jordan in her lower east side New York City apartment where she grew plants in available light with no artificial



ELVIN MCDONALD

Crassula deceptrix is on the opposite page. *Leptospermum scoparium*, New Zealand tea, in full flower is at left. Miniature plants can be trained as tree-form standards, shrubs, vines or ground covers.

supplements. This could explain in part why 'Tinkerbells' grows so easily when given half a chance. No other miniature is quite like 'Tinkerbells', whose small olive-green leaves are reddish on the reverse, on wiry stems to about six inches tall. The flower is tubular, small and delicate and rosy purple with a dark-spotted white throat. Elena gave me a rooted cutting about 20 years ago that has now formed a tuber the size of a medium potato — huge for a miniature sinningia. It grows in a six-inch plastic bulb-pan that came outfitted with a clear plastic dome. In bright light but no direct sun, or directly beneath the tubes of a fluorescent light garden, 'Tinkerbells' blooms about nine months of the year. It will grow more vigorously if dried off and kept at moderate temperatures for a semi-dormant period of three months. 'Cherry Chips' and 'Zelda' are more recent hybrids, bred in the Brooklyn basement of the late Marty Mines under fluorescent lights. They stay in a compact rosette and produce relatively large, notably brightly colored flowers.

There are easily enough tiny or miniscule orchids to keep any collector busy for at least a lifetime, not to mention miniature pelargoniums (geraniums), begonias (such as the miniature trailing 'Tiny Gem') and succulents (such as aloe, *Crassula lycopodioides pseudolycopodioides* and *C. deceptrix*) There are dorstenias galore (*D. mecca*, for example), and tiny creeping peperomias. And don't forget the highly trainable dwarf pomegranate, *Punica granatum nana*.

The Indoor Herb Garden

When winter arrives, you don't have to retreat to your living room and sulk. You don't have to pay the exhorbitant prices fetched by herbs at the specialty market. A cold season survival guide

BY ROB PROCTOR

For many gardeners, winter is an unwelcome vacation. We retreat from the garden and wait. Prized potted plants come indoors as well, many looking nearly as unhappy about the change of season as we do.

For herb growers accustomed to leisurely plucking sprigs from the summer garden, winter is a time to concentrate on growing favorites indoors. Some herbs continue to supply fresh leaves for stews and salads, while others can be coaxed to bloom or display ornamental foliage.

In the eyes of many gardeners, the most important herbs for window culture are those for the cook. We balk at the exorbitant prices fetched by herbs at the specialty market (if we can find them at all). The solution: grow them indoors.

Many cooks rely heavily on rosemary, thyme, chives and bay. These perennial or shrubby herbs are easily accommodated on most bright windowsills across the coun-



A kitchen herb garden includes, clockwise from top left: oregano, chives, sage, mint and lemon balm. Drying herbs hang above.

try, and will perform even better in a greenhouse. Other potted herbs that present no great challenge include sage, winter savory and a wide variety of mints. Container culture is even preferable for many of the mints to keep their rambling roots from conquering the entire garden.

The addition of citrus flavors to tea, pastries and salads is especially pleasant in winter. Lemon grass and lemon verbena mimic their namesake well. The former is relatively easy to keep going in a sunny window, where its leaves can be snipped, but the latter is a challenge. It often goes completely dormant, leaving a twiggy skeleton that only revives when the days become longer in spring.

Annual herbs, such as parsley, basil and nasturtiums, can be brought indoors as winter approaches. Use them while starting others. Often, cutting an herb back severely while continuing to fertilize will force new growth. Other annuals, including coriander, fennel, chervil and dill, can be started from seed and will be ready for use in just a month or so. Thinned seedlings are equally useful for garnish.

Ornamentals and aromatics for the window or fluorescent light garden include society garlic (*Tulbaghia violacea* 'Silver Queen'), which displays handsome, variegated leaves, although it must be positioned in a well-ventilated room. *Tulbaghia fra-*



JUDY WHITE

These herbal topiaries spend the summer outside and the winter indoors.

Nasturtiums can come inside as winter approaches.

grans has broader foliage and large clusters of lavender-pink or white blossoms that smell delightfully like hyacinths. Several tender species of lavender embellish the window herb collection, among them *Lavandula dentata, L. lanata, L.* x *latifolia* and *L. stoechas*.

Try holding over salvias from the autumn garden. *Salvia elegans*, aptly named pineapple sage, is prized for its fruitily aromatic leaves, brilliant red flowers and adaptability indoors. Other appropriate indoor salvias include the bright-flowered Texas scarlet sage (*S. coccinea*) and *S. gesneriiflora*, whose orange flowers are set off by chocolate-brown stems. At the opposite end of the color spectrum are *S. caerulea* (formerly *S.*



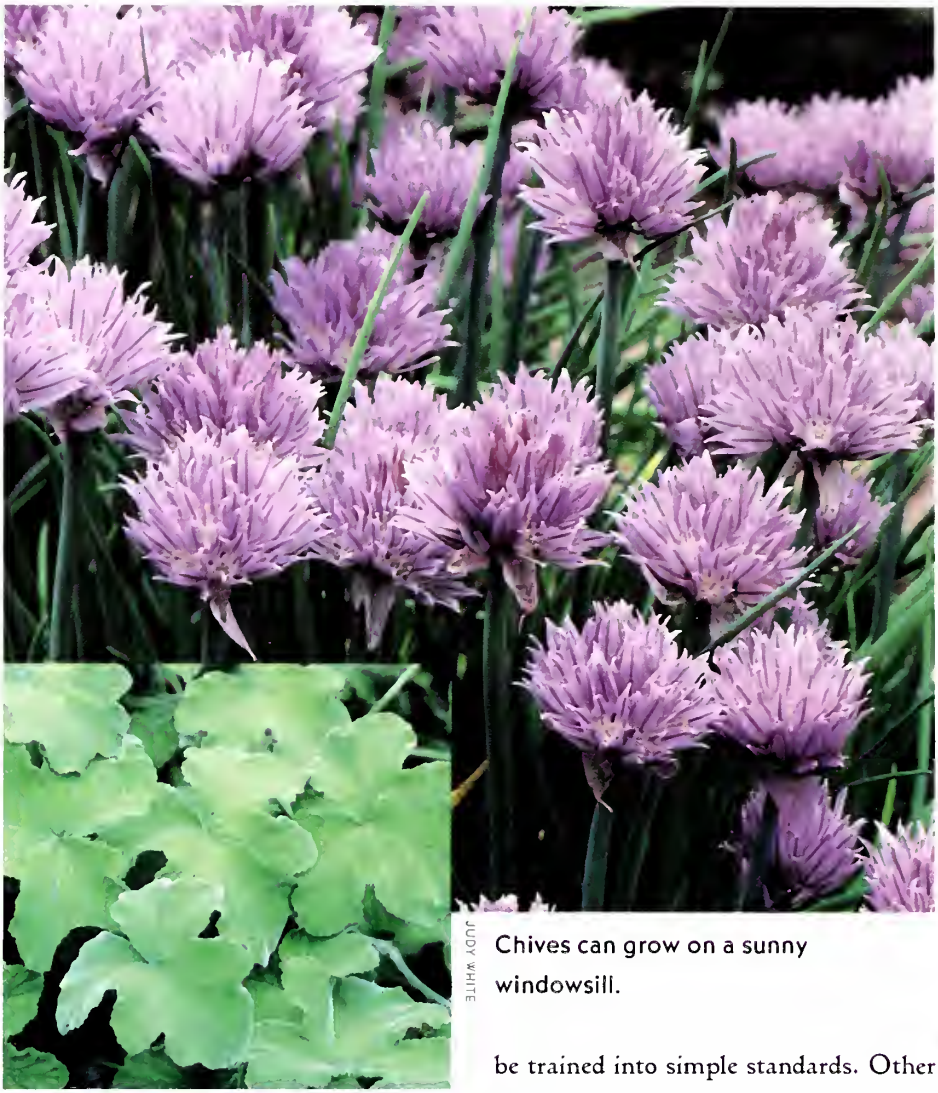
A handsome container garden mixes herbs, succulents and houseplants.

JUDY WHITE

Culinary sage grows easily in pots indoors.

guaranitica), with deep blue flowers, and *S. involucrata* 'Bethellii', with rosebud-like blossoms much too pretty to let freeze. Many of the tropical and subtropical sages don't get around to flowering until winter, so they make a dramatic statement on the sun porch. A number of these salvias attain dramatic proportions as well — five feet in height or more — so provide a suitably large display area.

While common sage, *S. officinalis*, is hardy across much of the country, it has several fancy-leaved forms that require winter protection. Some have leaves with cream and pink margins, while others are bronze or mottled mint green. These cultivars make striking pot plants or add to mixed plantings in containers. They can also



JUDY WHITE

Chives can grow on a sunny windowsill.

Peppermint-scented geranium is another good candidate for indoors.

be trained into simple standards. Other herbs also make easy-care topiary — rosemary and scented geraniums, for instance. Very light winter pruning keeps them in shape and provides leaves for cooking as well as sachets.

Bringing potted herbs indoors can strain them. They often sulk when faced with the lower light levels, compounded by the shorter days of winter. Many perennial herbs need a period of rest and will make their intention clear, dropping leaves and ceasing active growth. Low humidity levels indoors, caused by central heating, may result in leaf-tip browning and curling. It can be a dismal sight. There's no use pumping them full of fertilizer or drowning them with kindness. It will only hasten their

JUDY WHITE



Parsley grows well indoors. Here, curly and Italian parsleys grow together.

JUDY WHITE

Basil, which is tender and loves warm weather, is suitable for indoor culture.

demise. The best way to cope is to give potted herbs a very bright position supplemented by artificial light. Reduce watering by 50 percent or more until new growth begins.

Spider mites, white flies and aphids are commonly encountered pests for indoor herbs. Spider mites thrive when humidity levels drop. Grouping plants together (the "buddy system") increases humidity around the plants, as does adding gravel to pot saucers. Excess water fills the spaces between the gravel and raises humidity levels as it evaporates. A good sudsy bath in the kitchen sink helps to keep white fly and aphid populations down.

Geraniums

Geraniums for topiary,
geraniums with scented leaves,
geraniums with black blooms edged with gold...
there's a whole world of geraniums
beyond the local garden center

BY MARY ELLEN ROSS



NANCY BROWN

For blooming plants in a sunny window, geraniums are hard to beat. Of course, I'm talking about the plants that are known botanically as pelargoniums, introduced from South Africa to Europe early in the 17th century by Dutch traders. Botanists originally believed these to be closely related to the hardy geraniums already growing wild in the northern hemisphere. So, in 1753, the Swedish botanist Linnaeus described 25 species of these plants from South



MARY ELLEN ROSS

Regal geraniums, such as *P.* x *domesticum* 'Josephine', above, produce showy, azalealike blooms. They set bud only when night temperatures are below 60° F.

Africa under the genus *Geranium* in his *Species Plantarum*. Thirty five years later, L'Heritier, a French botanist, proved that they had been classified incorrectly and he coined the name *Pelargonium*. The public was unimpressed. To this day, we still say "geranium" when we mean "pelargonium."

From about 300 known species of pelargoniums, thousands of cultivars have evolved. To make it easier to identify the various types, different groupings were devised. Highlights from the groups follow.

ZONALE GERANIUMS

Pelargonium x *hortorum*, the horseshoe or popular florist geraniums, resulted from a cross of *P. inquinans*, a single-flowered red species, with *P. zonale*, a species bearing single red blooms as well as a dark horseshoelike ring marking each leaf. From this cross, the Standard and French types were developed. Standards are tall growing and

HOW TO GROW GERANIUMS

LIGHT

In winter, geraniums need all the sun they can get. From December to February, the sun's rays are not strong enough to promote buds on some varieties. From May to October, they benefit from light shade during midday. Geraniums grow best at night temperatures of 50 to 60° F. They will survive down to 32° F and above 80° F, but must be treated as semi-dormant and kept dry at either extreme.

SOIL

Most any type of soil mix is suitable for geraniums. They prefer a pH of 6.5 to 7, so additional lime is beneficial. I use equal parts loam, peat and perlite in my mix with a complete fertilizer such as 4-12-4 or a slow-release type like Magamp, which I add at the rate of 1/2 cup per bushel of mix. I also add one cup of dolomite lime.

WATER

Too little or too much water causes the leaves to yellow. Allow plants to approach dryness, then water thoroughly. During winter when light levels are low, geraniums should be even dryer between waterings.

DISEASES

Diseases often pose more of a problem than insects for geraniums. Black leg and virus are the most common afflictions. Black leg is a fungus that attacks bruised or cut ends and rots the stem either from the roots

useful in making topiary. The French type are more compact and became the parent of our modern day bedding and dwarf geraniums.

Many commercial growers produce their annual crop of Zonale geraniums from seed. There is a wide variety to choose from, such as the dwarf "Gremlin Series"and the vari-colored "Orbit Series." Earliest to bloom is the "Pinto Series." The tetraploids in the "Tetra Series" have extra large flower heads.

upwards or from the tip downwards. In either case, cut off the diseased part and treat the cut end with fungicide. Be sure to destroy all diseased parts to prevent the fungus from spreading to other plants.

Prevention of disease is paramount because there are no cures. Controlled watering and scrupulous sanitation — keeping dead and yellowing leaves and flowers picked off, using sterilized soil and using clean tools — can do much to prevent disease.

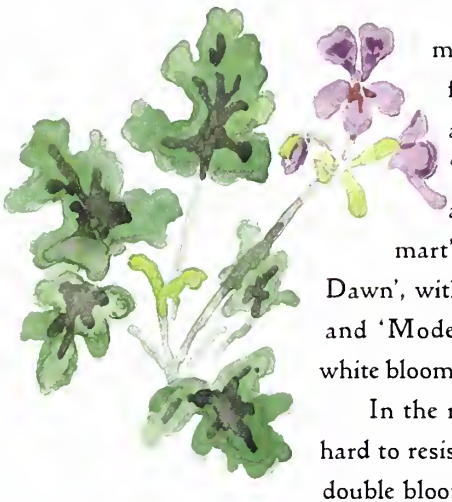
Some problems are difficult to detect. A plant may be infected with virus and still look healthy during its growing season. However, one sure symptom of virus is yellow or brownish spots on the young growth. When signs of virus are detected, it's best to discard or at least isolate the infected plant.

Thick, leafy growth appearing at the base of a plant is called leafy gall or fasciation. It does no great harm but should be removed because it competes with the roots for food. Little is currently known about the cause of this phenomenon. It is best not to take cuttings from an affected plant.

During long periods of rainy weather, leaves turn yellow rapidly, making conditions ideal for the growth of a gray fungus called botrytis. This may not be a problem in the home where humidity levels are usually low. Keeping yellow leaves and dead flowers picked off will help.

Because geraniums are fast growing, an occasional cutting back of the growing tip will help keep them low and bushy. On most varieties, it will take three to four months before blooming continues. Tall plants can be pruned back to two or three nodes from the base of the plant and new growth will quickly develop. For winter blooms, cut plants back in August. For Memorial Day blooms, pinch in February.

NANCY BROWN



P. quercifolium 'Fair Ellen'

Despite the flood of seed-grown geranium most garden centers still carry some double-flowered types from cuttings. My favorites are the older varieties, including 'Enchantress Fiat', a double light pink; red and orange 'Ricard'; 'Marquis de Montmart', a deep purple with orange tints; 'Prairie Dawn', with glowing, fully double bright pink flowers; and 'Modesty', with an abundance of large, snowy white blooms.

In the rosebud group, 'Appleblossom Rosebud' is hard to resist. It bears beautiful, white- and pink-edged double blooms in tight clusters. Each floret looks like a tiny rosebud. 'Red Rosebud', 'Pink Rosebud' and

MARY ELLEN ROSS



P. x *domesticum* 'Roger's Delight'. Regal geraniums such as this will bloom for a long time on a sunny windowsill.

'Magenta Rosebud' all have similar clusters of rosette-shaped blooms.

Then there is the cactus or poinsettia type of Zonale with curled and twisted petals, so named because it resembles cacti or poinsettias. 'Cherry Poinsettia' is my choice for red, 'Hilda Conn' is a personal favorite in salmon and 'Noel' is the best white.



P. fragans 'Nutmeg'

FANCY-LEAVED ZONALE GERANIUMS

Grown primarily for their colored foliage, fancy-leaved geraniums are beautiful even without blooms. Fancy-leaved geraniums also have their groupings — the silver-leaved types, gold- and bronze-leaved hybrids and the tricolored types displaying combinations of white, silver, red and bronze. 'Skies of Italy' is the strongest tricolor, with maple-shaped leaves painted with bands of yellow, bronze and red. Its small, single, orange blooms are insignificant compared to the brilliant foliage. 'Mrs. Henry Cox', introduced in 1879, is not as bushy as 'Skies of Italy', but the leaf color — brilliant tones of yellow, red and pink — is more intense. 'Miss Burdett Coutts' is even more difficult to grow. Its colors are more pastel silvers pinks and bronzes.

In the silver-leaved group, the popular 'Wilhelm Languth' is most robust, but a little tall growing. It blooms freely with medium-sized, double, cherry-red flowers. 'Mrs. Parker' is lower growing but not as strong. It has double light-pink blooms. These are only a few of the more than 50 fancy-leaved geraniums available today.

THE MINIATURE GERANIUMS

Perhaps the ultimate in Zonale geraniums are the miniature and dwarf types. In the mid-1940s, there were only two that could be considered truly dwarf or miniature. They were 'Black Vesuvius', which originated in England about 1890, and 'Mme Fournier', introduced in France a few years later. Credit for the modern day dwarf and miniature geraniums goes to two California hybridizers, Ernest Rober and Holmes Miller. Rober used 'Black Vesuvius' and 'Mme Fournier' to produce his famous "Seven Dwarfs," while Miller independently employed the same parents to create 'Pixie', a dark-leaved dwarf with single salmon flowers. Other hybridizers soon joined in. Today there are several hundred named varieties with such fairytale names as 'Goblin', 'Red Riding Hood', 'Pigmy' and, of course, 'Snow White' and 'Bash-

NANCY BROWN



P. 'Skelley's Pride'

ful', 'Doc', 'Dopey', 'Grumpy', 'Happy', 'Sleepy' and 'Sneezy'.

How do the dwarf and miniature geranium differ from the regular Zonales? They all have very small leaves, short internodes and bushy growth. They seldom grow taller than 12 inches, and the real miniatures do not exceed six inches. However, their stature is affected by sunlight, fertilizer and other factors.

ODD AND RARE GERANIUMS

The odd and rare group is comprised of species of interest mainly to collectors, but a few are distinctive and very attractive. *P. violarium*, a semi-trailing type, has lance-shaped gray leaves and blooms much like those of a pansy. The flowers of *P. echinatum*, the sweetheart geranium, are single white with a red heart-shaped center. They are borne on long stems above steel gray leaves and thorny branches. *P. glaucifolium*, the black-flowered geranium, bears scented, dark maroon flowers edged with gold. On the other hand, *P. fulgidum*, the celandine-leaved storksbill, has woolly, gray-green, musky scented leaves and dark garnet-red blooms.

THE REGAL GERANIUMS

The Regal or Martha Washington geraniums (*P.* x *domesticum*) produce spectacular azalealike blooms, but they have their drawbacks and are primarily used as a holiday plant for Easter and Mother's Day. They set bud only when night temperatures are below 60° F; consequently, unless you have a greenhouse or cool plant room, it's best to buy them from your florist after the buds are set. Then you can enjoy a long period of blooms in a sunny window until hot weather sets in. Cuttings root best in the fall when plants should be cut back, repotted and grown in a cool, 45 to 50° F greenhouse. Keep them on the dry side until February, when they can be fertilized and watered more frequently. Unlike the Zonale geraniums, they need more water during their budding and blooming period.

White fly and aphids can be a major problem. However, they can be controlled if you watch your plants closely, use a soap spray when the insects first appear, then pick

off the leaves that show white fly nymphs on the underside.

As with the other groups, there are many regals to choose from. A few of my favorites are 'Flower Basket', with salmon pink flowers, the earliest to bloom even during hot weather; 'Josephine', which grows rather tall but is a constant bloomer, with pink and white flowers even in the heat of summer; and 'Black Lace', popular for the novelty of its all-black flower. There are also pansy-flowered and miniature regal geraniums. 'Mme Layal', introduced in France in 1870, is still the best pansy-faced flower, with small blooms of royal purple and white. 'Spring Park', in the miniature regal group, blooms all summer with white, pink-eyed small blooms and fragrant, bright green leaves.

SOURCES

SHADY HILL
821 Walnut St.
Batavia, IL 60510
(708) 879-5665
Catalog: $2

LOGEE'S GREENHOUSES
141 North St.
Danielson, CT 06239
(203) 774-8038
Catalog:$3
(refundable with first order)

MERRY GARDENS
P. O. Box 595, Mechanic St.
Camden, ME 04843
(207) 236-9064
Catalog: $2

THE SCENTED-LEAVED GERANIUMS

The scented-leaved geraniums are grown primarily for their attractive, fragrant foliage. Like the regal geraniums, most scenteds bud only when temperatures are below 60° F. While pretty, the blooms are mostly small, usually in shades of pink or lavender. 'Clorinda' and 'Roger's Delight' have more spectacular blooms like those of the regal geraniums. They have many of the same cultural needs as the regals although they are not as susceptible to white fly.

Enjoy their scents and use the leaves in cakes, teas, punch, butters, salads and salad dressings. Rose, lemon, lime, nutmeg, and peppermint are the types used in cooking. Popular scents are rose, strawberry, orange and lemon.

IVY-LEAVED GERANIUMS

The ivy geraniums (*P. peltatum*) are trailing, vining types with glossy leaves resembling ivy. Although they bloom at all seasons, they don't make good houseplants because they need cool temperatures, strong light and fresh air.

Rarities for the Indoor Garden

Unknown to most gardeners just ten years ago, frangipanis, bougainvilleas and other tropical species have become the hot houseplants of the 90s

BY RICHARD & MARY HELEN EGGENBERGER

When we're selecting tropical flowering houseplants, we look for plants with the following traits: compactness, ease of bloom, long flowering season, eye-catching shapes and colors, low maintenance and, whenever possible, fragrance. With these virtues in mind, we've composed a list of our favorite choices.

PLUMERIAS

Unknown to most gardeners ten to 15 years ago, plumerias have become some of the most prized tropicals of the 90s. Many of the new hybrids bear immense clusters of flowers with individual blooms often five to six inches across! The array of colors is astounding as is the spectrum of scents, ranging from lemon to rose, jasmine, spice and even coconut.

Because plumerias are native only to southern Mexico, northern South America and the Caribbean, they were once considered impossible to grow in non-tropical areas. However, through research and experimentation, enthusiasts have found that plumerias can easily thrive throughout the U.S. outdoors during hot weather; in

PHOTOS BY R M & M H EGGENBERGER



Top: *Plumeria* 'Dean Conklin', left, and *P.* 'Loretta', right
Bottom: *P. obtusa* 'Singapore', left, and *P.* 'Tomlinson', right

sunrooms, greenhouses, under lights or stored in a dormant state during winter.

Plumerias are often called frangipanis, a common name that has been traced to two derivations — the first in honor of the Italian nobleman, Frangipani, who invented the intoxicating perfume with the plumeria fragrance that became the favorite of Catherine de Medici. The name may also stem from French settlers in the Caribbean who called the plant "frangipanier," or coagulated milk, alluding to the heavy latex that flows from a cut in the tree. In addition, plumeria is often called the lei flower in Hawaii, its adopted home.






PHOTOS BY R. M. & M. H. EGGENBERGER

Top: *Bougainvillea* 'Helen Johnson', left, and *B.* 'California Gold', right
Bottom: *Hibiscus* 'All Aglow', left, and *H.* 'Tylene', right

Tip cuttings (do not use stem cuttings) of plumeria root easily if the latex at the base of the cutting is allowed to dry out. Place cuttings in coarse perlite and provide bright light but no direct sun. Keep them somewhat on the dry side. The best season for taking cuttings is spring to mid-summer. Cuttings of hybrids should flower the first year after rooting.

Although a few extraordinary dwarf forms exist, most plumerias can be kept compact by fertilizing with a low nitrogen and high phosphorus fertilizer. Plumerias are heavy feeders and respond best to regular fertilizer applications during the

growing season. Plants are long lived and long blooming, often flowering for months at a time, usually from mid-spring through fall. They are sun- and heat-loving plants – the more, the better. A minimum of five hours a day is recommended for optimum bloom outdoors. Their moisture requirements are moderate to light, and they prefer a well-drained soil rich in organic matter.

BOUGAINVILLEAS

Bougainvilleas make excellent container specimens and can flower many times a year. Today, with new hybrids continually appearing, the selection of compact varieties suitable for house culture is excellent and includes a veritable palette of showy bract colors and leaf variegations.

Plenty of bright sun is a must for sturdy growth and to promote cascades of bloom so massive that they completely cover the vine. A minimum temperature of 60° F is also preferable during the blooming season. What's more, there is a secret to encouraging bougainvilleas to flower, which we learned during our years in India from the bougainvillea expert, Mr. B. A. Rama Rao of Madras: after plants are well established in their containers, gradually withhold water, just to the point of shock. Begin by giving water only on alternate days. After a week, water every third day. After another week, water only once a week for a week or two. Then hold back watering for ten to 14 days. The leaves will droop or even fall from their branches. Now you can begin a regular program of fertilizing and watering, encouraging the plants to burst into bloom. Although this seems like a drastic treatment, it replicates nature's conditions in their native Brazil, where plants go through long, dry spells followed by heavy rains. For best results, use a fertilizer formulated for bougainvilleas or one fairly high in nitrogen, only moderate in phosphorus and high in potassium with all the trace elements, especially magnesium, in abundance.

HIBISCUS

Few plants can rival hibiscus in their extraordinary range of colors and color combinations, flower shapes and sizes and ability to produce continuous bloom throughout the year. Hibiscus hybridizers have developed single and double flowers in shades of blue, brown, yellow, gold, orange, red, pink and every color in between, with some flowers exhibiting three or more colors in a single blossom. They have also bred compact plants, some bearing blossoms that last two to three days. Current emphasis is on creating blooms with good substance as well as clear color and exceptional keeping quality. In addition, some hybridizers are now turning their attention towards developing fragrant blooms by crossing the few fragrant species that exist in nature.

There are a few important cultural requirements you need to know in order to grow beautiful hibiscus. At the top of the list is fertilizer. Unlike so many tropicals that flower best with ample amounts of phosphorus, hibiscus need *low* phosphorus and high potassium. They would perish if given the same fertilizer as plumerias! Too much nitrogen will push growth at the expense of bloom.

Hibiscus are attacked by a number of pests, ranging from aphids to white fly to mealy bugs. We have found that insecticidal soaps, pyrethrins and diatomaceous earth are effective. An occasional brisk spray of plain cold water will wash off aphids. One of our most successful and inexpensive controls is a simple formula that immediately kills adult white flies: mix two tablespoons of household vinegar and two tablespoons of household ammonia per gallon of water, spray the infested plants and watch the amazing results.

DWARF GINGERS

The dwarf gingers also offer a wide range of flower shapes, sizes and colors, and they are virtually insect and disease free. They often have fragrant leaves or blossoms and, in some genera, beautifully marked and colored leaves as well. Among our favorites are:

GLOBBA WINITTII, dancing lady ginger — If we must choose a favorite dwarf ginger, this is the one. The dancing lady is graceful in every sense of the word. From mid-summer through fall this lovely plant will be in constant bloom. First the long, pendulous inflorescences unfurl. Next, the glowing lavender-pink bracts emerge, followed by the delicate golden flowers that look like miniature ballerinas. Mature plants bear numerous inflorescences to six inches or more in length, emerging from compact, lush blue-green foliage. Plants may be increased by division in spring. Use plumeria fertilizer (see above) or any time-release fertilizer high in phosphorus. *Globba winittii* prefers shade or filtered light and can be grown and brought to bloom in small containers. Few plants are as carefree as this gem.

KAEMPFERIA GALANGA — Another dwarf ginger of special merit, *Kaempferia galanga* has dark green, rounded leaves with prominent veins. The sparkling white, violet-shaped flowers have a striking royal-purple spot on the lip. Plants of this species rarely exceed six inches in height.

KAEMPFERIA ROTUNDA — Commonly called resurrection lily or tropical crocus, this is a rare form of peacock ginger, with striking markings of pale, silvery lavender on elongated leaves. Numerous lovely, purple-tinged white flowers with lilac lips appear in the spring before the leaves emerge. The resurrection lily can be flowered in a six-inch pot year after year.

PHOTOS BY R. M. & M. H. EGGENBERGER









Top: *Globba winitti,* left, *and Kaempferia galanga,* right
Bottom: *Kaempferia rotunda,* left, and *Mandevilla sanderi* 'Red Riding Hood', right

SMALL FLOWERING VINES

There is a wealth of small flowering vines that can be grown in containers for the indoor garden, sunroom or greenhouse. Some of the loveliest bloomers are:

MANDEVILLAS — These modest vines produce masses of blooms and do best in warm, sunny conditions. You can use a water-soluble or time-release plumeria fertilizer (see above) or a fertilizer high in phosphorus with excellent results. Among the finest cultivars are *Mandevilla* x *amabilis* 'Alice du Pont', with very large, brilliant rose-pink flowers; *Mandevilla sanderi* 'Red Riding Hood', a compact plant that makes an excellent hanging

SOURCES

THE PLUMERIA PEOPLE
P.O. Box 820014
Houston, TX 77282-0014
Catalog, $2

LOGEE'S GREENHOUSES
55 North Street
Danielson, CT 06239
Catalog, $3



PHOTO BY R.M. & M.H. EGGENBERGER

Passiflora 'Jeanette'

basket with glossy, bronzy green leaves and deep rich pink flowers; *Mandevilla sanderi* 'Rosea', a small vine with clear rose-pink flowers each with a yellow throat; *Mandevilla boliviensis*, which bears white, trumpet-shaped flowers with glowing yellow throats set dramatically against glossy, dark green leaves; and *Urechites lutea*, a close relative with bright yellow flowers set against glossy green leaves.

CLERODENDRUM — Both *Clerodendrum thomsoniae*, a modest climber prized for its lovely red flowers set in puffy white calyces, and *Clerodendrum* x *speciosum* with scarlet-red flowers set in magenta bracts, are long blooming and do best in morning sun with shade or filtered light in the afternoon.

JASMINES — It would be possible to go on and on about the marvelous jasmines, which justly top the list of the world's most fragrant flowers. Our favorite, again among many, is the 'Belle of India', a modern cultivar of the sambac (or Arabian) jasmine. Similar to the popular *Jasminum sambac* 'Maid of Orleans', this variety bears fully double flowers with numerous petals and a fragrance that will perfume an entire room. Dried blooms add an exotic flavor to tea. Plants bloom almost continuously from spring through fall.

PASSIFLORAS — Most passion flowers grow too rapidly to be considered for the indoor garden unless you have ample room. There are a few, however, that have more compact habits with shorter internodes. Our particular favorite is *Passiflora* 'Jeanette', almost always in bloom from spring to fall and one of the easiest to flower. Blooms are approximately three inches across and a rich lavender-blue color with pink shading and a darker purple corona. Other hybrids are becoming available from hybridizers around the world.

The African Violet Family

A little bit of rainforest for your living room

BY LARRY HODGSON

The African violet family, also known as the Gesneriad family, is composed of some 125 genera and over 200 species. That's not a lot as far as plant families are concerned, but gesneriads nevertheless take up a proportionally large share of our indoor growing space, and no wonder — they perform and bloom indoors over and over again.

The reason gesneriads do so well indoors is because the average interior is quite similar to their native habitat. Most gesneriads grow as understory plants in tropical forests. They're adapted to moderate light, periodic drying, varying humidity levels and warm temperatures the year round. These same conditions prevail in the average living room.

Gesneriads are generally divided into three groups, depending upon their storage organs (or lack of them): fibrous rooted, tuberous and rhizomatous.



LARRY HODGSON

African violet (*Saintpaulia* species)

FIBROUS-ROOTED GESNERIADS

This is actually a group formed by default: any gesneriad that doesn't bear tubers or rhizomes is called fibrous rooted. It is by

far the largest category, and it also contains the largest number of popular houseplants.

African violets (*Saintpaulia* spp.) are the most popular fibrous-rooted gesneriads. The wild species native to eastern Africa all look quite similar, typically with violet-shaped, five-lobed, blue flowers. In culture, through mutation and hybridization, they have become an extremely varied group of plants. Double and semi-double flowers are now common in shades from white to pink to red and pale blue to deep purple. There are even yellow- and green-flowered and multicolored African violets. They range in size from micro-miniatures scarcely larger than a quarter to plants that spread wider than a foot across. Most form low-growing rosettes, although there are also multi-stemmed trailers. Their foliage can be all green or variously marbled in white, pink or tan.

Next in popularity is the *Streptocarpus*, or Cape primrose, which bears long, tongue-shaped leaves directly from the roots, showing no visible stem. Most streptocarpus form rosettes but some species produce only a single leaf during their entire lives. The flowers are generally borne on slender stems high above the foliage. They are distinctly trumpet-shaped and come in all shades except yellow, orange and green. The closely related genus, *Streptocarpella*, bears flowers that are very similar but smaller than those of the streptocarpus. However, the leaves of the streptocarpellas are notably different: they are small, oblong and borne on branching stems.



CHARLES MARDEN FITCH

Streptocarpus 'Ultra Nymph'

The genus *Episcia* is also well known for both its interesting foliage and showy flowers. The leaves are attractively marked in various metallic shades from green to white to purple to red — some even have leaves that are shocking pink. The tubular flowers are produced on short stalks and are often brightly colored, with brilliant orange-red the most common shade. Episcias have another striking characteristic: they produce creeping stolons (stems) with plantlets at their tips displayed to best advantage in a hanging pot. Plants in the genus *Alsobia* also have stolons, but they bear small green leaves and highly fringed white flowers.

The genus *Chirita* is becoming more popular. The best known species is *Chirita sinensis*, with thick, stiff leaves in a dense rosette. The leaves of most cultivars of this plant are marbled in silver, and the purple flowers are very similar to the blossoms of African violets.

EPIPHYTIC GESNERIADS

Many fibrous-rooted gesneriads have adapted to living not in the ground, but on tree trunks and branches. These types, called epiphytes, generally have smaller, thicker leaves and longer hanging or upright branches than their terrestrial cousins. They are well adapted to extreme conditions and prefer drier soil conditions than other gesneriads.

The genus *Aeschynanthus*, from Asia, is often called the lipstick plant because its brightly colored flowers poke out of tubelike calyces. The leaves generally have a waxy texture, and the narrow, tubular flowers are often bright red or orange. The genus *Columnea* is very similar in appearance but hails from the New World. Most aeschynanthuses bear their flowers in clusters at the ends of their stems during a brief season, whereas columnea species and hybrids produce flaring, yellow to red flowers along the leaf axils over a longer blooming period. Due to those flaring tubes, columneas have been nicknamed goldfish plants.



CHARLES MARDEN FITCH

Columnea 'Red Spur'

Although *Nematanthus* are closely related to columneas, they scarcely resemble them. Their small, often shiny leaves are borne on trailing stems. The small orange, yellow or red flowers are tubular with a large bulge at the base, giving them quite a curious look and earning them the equally intriguing nickname of guppy plant. Nematanthuses hail from South America.

Without flowers, plants in the genus *Codonanthe*, from South and Central America, look a lot like nematanthuses with small leaves on trailing stems. However, when they come into bloom, the small, flared, white flowers reveal their true identity. The two genera have been crossed with standard-sized plants, producing the hybrid genus x *Codonatanthus*, which has characteristics of both.

TUBEROUS GESNERIADS

Some gesneriads form large, generally underground storage tubers, rather like woody potatoes. Most tuberous species go completely dormant after flowering, losing their foliage entirely. Just take your cue from the plant and stop watering until it sprouts again several months later.

The florist gloxinia, *Sinningia speciosa*, is by far the best-known tuberous gesneriad. But this sinningia's bell-shaped flowers are hardly typical of the genus — in fact, the wild species bear trumpet-shaped flowers much like those of the streptocarpus. Florist gloxinia flowers tend to be beautifully spotted and can be just about any color except yellow, orange or green. Double-flowered varieties are also available.



LARRY HODGSON

Sinningia speciosa, florist's gloxinia

Numerous other sinningia species and hybrids are widely available. *S. cardinalis* bears cardinal red, narrowly tubular flowers over hairy, apple green leaves and upright stems. The similar *S. canescens* (formerly *S. leucotricha*) is so totally covered in white hairs that its foliage appears quite silvery. Even the flowers are fuzzy! *S. eumorpha* bears rosettes of large bronze leaves and slipper-shaped flowers, generally white or pink.

Very different is the tiny *S. pusilla*, scarcely larger than a nickel, with equally tiny lavender, trumpet-shaped blooms. Its need for high humidity makes it a good choice for terrarium culture. *S. pusilla* and the related "micro-miniature" species, *S. concinna*, have been crossed to give a wide range of hybrids called miniature sinningias. Most are four to six inches in diameter and have trumpet-shaped flowers in a wide range of colors. Miniature sinningias rarely go dormant; new stems are produced before the older rosettes have died. The same plant will remain in bloom most of the year.

The only other tuberous genus of horticultural importance is *Nautilocalyx*. These are extremely beautiful plants, often with deep reddish or hairy, quilted, silver-marked leaves. The flowers are generally hidden among the leaves. The most popular member of the genus is *N. lynchii*, with dark, shiny purple leaves.

RHIZOMATOUS GESNERIADS

Gesneriads in this group produce scaly rhizomes at the end of one growing season that die back once growth has begun the following spring. Each plant produces many rhizomes, so multiplication is a snap. Another propagation method is to scrape off the scales at the beginning of the growing season and sow them like seeds. Each will produce a plant.

Although rhizomatous gesneriads can and should be allowed to dry out entirely during their dormant season, they need ample water during the growing season or they will slip into premature dormancy or perish entirely.

The best known rhizomatous gesneriad is *Achimenes*. Widely available in bulb catalogs, it is strictly a summer grower, sprouting in spring and dying back the next fall. It is used indoors and out, often in hanging baskets. The wide-faced trumpet flowers are large in relation to the size of the plant and are available in literally every color of the rainbow.



CHARLES MARDEN FITCH

Achimenes longiflora

Plants in the genus *Kohleria* have thick stems and large hairy leaves, often attractively marbled. The flowers are trumpet shaped with striking contrasting spots on a yellow, pink, red or green background. *Kohleria* flowers are borne at leaf axils, a trait that is the major difference between them and the similar genus *Smithiantha*, whose flowers are borne in clusters at the tip of the plant. Many smithianthas have velvety maroon or deep red leaves which really don't have their match elsewhere in the plant kingdom. Flower colors tend to be various shades of yellow with contrasting red spots and marbling.

EASY TO GROW

Gesneriads grow best in bright light with some morning sun. They're particularly floriferous under fluorescent lights. Lack of light often results in healthy foliage but few or no flowers.



CHARLES MARDEN FITCH

Saintpaulia 'Dolly'

Although gesneriads prefer humidity, especially when in bloom, they will tolerate dry indoor air. Average indoor temperatures are fine, as are most light potting mixes. For maximum bloom, feed your plants regularly with flowering plant fertilizer. Gesneriads generally prefer their potting mix to be kept slightly moist. During the dormancy periods, hold back the water from tuberous and rhizomatous types. Epiphytic gesneriads should dry out slightly between waterings.

Propagation is easy. You can take stem cuttings, but most gesneriads (especially those with thick leaves) will also readily produce plantlets from leaf cuttings. Most gesneriads are also especially easy to grow from seed, often blooming within a year after sowing. The seeds are extremely tiny and should not be covered with potting mix as light is necessary for germination.

Easy to grow, easy to bloom, gesneriads are also, for the most part, very easy to find. In addition to local nurseries, there are hundreds of mail-order specialists devoted to African violets and other gesneriads. You'll find their ads in the publications of the various gesneriad societies listed below:

African Violet Society of America
P. O. Box 1401
Beaumont, TX 77704

African Violet Society of Canada
1573 Arbordale Ave.
Victoria, British Columbia V8N 5J1

American Gloxinia and Gesneriad Society
c/o The Horticultural Society of New York
128 West 58th St. New York, NY 10019

Gesneriad Society International
1109 Putnam Blvd.
Wallingford, PA 19086

Saintpaulia International
1650 Cherry Hill Road South
State College, PA 16803-3214

The Leaves Have It

Palms for Victorian parlors, cacti for Santa Fe-style interiors, clipped topiaries for classical decor — there's a foliage plant to suit every taste

BY LINDA YANG



hen green thumbs are blue with winter cold, the indoor sill is the garden location of choice. Take the scene at George and Virginie Elbert's upper west side New York City apartment, which is landscaped with over 500 houseplants — give or take a pot or two. Windowsill space has been extended by tiers of shelves and movable tables, and every cranny is covered with vegetation.

The Elberts' collection of tropical plants includes many that are appreciated more for their decorative leaves than for blooms, and their gardening fervor for these species approaches missionary zeal. "Foliage plants — as we call these kinds — are easy. Anyone can grow them and everyone should," in the words of Mr. Elbert. For, even during long, winter-darkened days, plants like asparagus fern, spathiphyllum, philodendron and sansevieria manage to thrive.

On the other hand, houseplants grown primarily for flowers demand more effort, attention and light. Where conditions are difficult, few of these do well after their first blooming. Some may even be discarded. "But foliage plants are permanent residents — like pets," according to Mrs. Elbert. "What I like most are the many different leaf shapes and variations of color — green on white, green on yellow, with pinks, reds, blotches and stripes."

FOLIAGE PLANTS FOR WINDOWSILLS

Plants that Tolerate Bright Reflected Light

Aspidistra elatior minor

Ardisia crenata

Cordyline terminalis 'Tricolor'

Peperomia obtusifolia

Maranta leuconeura

Leea coccinea

Plants that Tolerate a Minimum of Three Hours of Sunlight Daily

Aloe vera

Citrus reticulata 'Dancy'

Nolina recurvata

Alpinia zerumbet 'Variegata'

Ananas comosus 'Variegatus'

Kalanchoe beharensis



GEORGE ELBERT

Citrus reticulata 'Dancy'

Plants that Do Best with a Minimum of Five Hours of Sun Daily

Portulacaria afra 'Variegata'

Jacaranda mimosifolia

Pachypodium lamerei

Rosmarinus officinalis

Zamia floridana


CHARLES MARDEN FITCH

Spathiphyllum 'Lynise'


CHARLES MARDEN FITCH

Aechmea fasciata

The Elberts'dedication to indoor landscaping dates back to around 1960 when they first moved to a New York apartment. They have since helped found the Indoor Gardening Society, which now numbers over 2,000 members nationwide, and co-authored more than a dozen books.

In the past 30 years, the Elberts have witnessed indoor gardening trends, many of which, they suspect, were a function primarily of what commercial growers made available at the time. Asparagus ferns, grape ivy and philodendrons were in wide use in the 1960s. Designers found these plants were useful not only for softening severe architectural styles but for surviving long periods of poor growing conditions. In the 70s, the presence of shopping malls and atriums led to the introduction of large foliage species whose scale was suited to vast public spaces. It was not long before designers discovered that these tree-size weeping figs, cycads, palms, fiddleleaf figs and dracaenas were sufficiently versatile to serve in homes as free-standing sculptures. They could also be grouped together, creating living screens to divide up space. In the spare modernist vernacular, it was legitimate to use plants, not furniture, to fill the void.

Throughout the 80s and into the 90s, post-modernist trends have meant that a wider variety of architectural styles need to be satisfied, and growers now scramble to accommodate designers' visions. Aspidistras and palms seem cozily at home, for example, amidst Victorian trappings. Odd or spectacularly shaped cacti, bromeliads and euphorbias presently grace Memphis or Sante Fe style interiors. And formal clipped topiaries of rosemary or myrtle enhance classical decor.

But plants are living things. And unless the intention is to replace them regularly,



GEORGE ELBERT

Dracaena tricolor

they must be chosen not only for their architectural contribution to a room, but for their ability to tolerate the environmental conditions within that room.

Beginners should start with plants that are easily grown and not be concerned that everyone may have them, Mr. Elbert advises. "A well-grown foliage plant can be a superb decoration for a troublesome spot. Why be a snob about commonly found plants?"

Those just starting might consider a spider lily, which has long, white striped foliage; or the variegated basket grass (*Oplismenus hirtellus* 'Variegatus'), whose dainty, pink-hued, striped leaves dance on top of pinkish stems; or possibly a dumb cane plant, whose bold, oval-shaped foliage is marbled with green and white. These plants withstand less than an hour or two of sun, are rarely bothered by pests or diseases and are most forgiving of neglect.

Also tolerant of less than ideal indoor landscapes is the lady palm (*Rhapis excelsa*) which has dark green, ribbed leaves whose ends appear to have been fringed with pinking shears; and *Alocasia* 'Fantasy', whose 15 inch-long, arrow-shaped leaves have wavy edges. For them, minimal sun or only bright light will suffice.

Of particular interest, too, are foliage plants that are fragrant. For double service — decoration and culinary use — there is sweet bay (*Laurus nobilis*), whose dark green, leathery-looking leaves tolerate as little as two hours of sun daily. Somewhat more demanding of sunlight is the Jamaican allspice tree (*Pimenta dioica*), whose oblong, fragrant foliage is also useful in stews. And then there are the many scented geraniums that can be added to potpourri or jellies. Among the Elberts' favorite scented geraniums are 'Dr. Livingstone', with finely cut foliage that emits a perfume redolent of lemon and roses, and the sweetly scented apple geranium, which has rounded, softer textured leaves.

Although foliage plants from the tropics are now taken for granted, they have served as indoor decoration only since the middle of the 19th century, according to Tovah Martin, author of *Once Upon a Windowsill* (Timber Press, 1988), a history of indoor plants. "Until the Victorian era, plants lived outdoors and we lived indoors — the cultivation of houseplants is a relatively recent event," writes Ms. Martin. "The early Colonists did bring in a few of their practical garden herbs. But tropical plants didn't arrive in North America until the advent of the 19th century plant explorers and the invention of the Wardian case, the glass enclosure that permitted long distance transport of plants."

Large foliage plants are relatively inexpensive, but there's an advantage to starting with smaller specimens. If you buy them when they're young, they'll adjust more easily to your conditions.

Acclimatizing large plants that have recently left the ideal conditions of a commercial greenhouse may occasionally be a trial for both plant and plant owner. Lost leaves and drooping branches are classic symptoms of "plant shock." Some species have particular difficulty adjusting. The Ming aralia, for example, doesn't like being moved at all and shows its distress by dropping its parsleylike foliage immediately. The weeping fig can also be temperamental in this way. "Give them time to get over their sulks," Mr. Elbert says, "If you can just resist overwatering and feeding them, they'll soon recover and grow new leaves."

SOURCES

Glasshouse Works Greenhouses
Church Street
P. O. Box 97
Stewart, OH 45778
Catalog $1.50

Kartuz Greenhouses
1408 Sunset Drive
Vista, CA 92083
Catalog $2

Lauray of Salisbury
432 Undermountain Rd.
Salisbury, CT 06068
Catalog $2

Logee's Greenhouses
141 North St.
Danielson, CT 06239
Catalog $3

Rhapis Gardens
Box 287
Gregory, TX 78359
Catalog $2

Adapted from an article that first appeared in *The New York Times*.

For Happy Gardenias

Drink more coffee

BY PATTI HAGAN

I am a gardenia *appassionata*, having been smit at birth by a whiff of *Gardenia jasminoides* in my native Hawaii. Ever since departing my first garden there, I have tried to lead a gardenia-accessible life. It has not been easy.

Over the years, in sundry overheated, undersunned New York City caves, I have killed scores of gardenias. After each gardeniacide I would wait a decent interval and then, ever the Sisyphean gardener, buy another. I would cart it home in full bud, Proustily expectant of the first redolent waft of benzyl acetate-styrolyl acetate-linalool-linalyl acetate-terpineol-methyl-anthranilate — Gardenia Absolute. Within days the fat green buds would yellow, brown off and drop off: the gardenia would drop dead.

During the '80s I tried self-help in re gardenias. I consulted Thalassa Cruso's *Making Things Grow*. Ms. Cruso began by aspersion: gardenias behave like "temperamental prima donnas" and "only children." She continued by confession: "I am one of those people who can do nothing with gardenias." Then, after declaring "advice about gardenias indoors is very hard to give," she gave her best: "I don't think a novice should spend money buying such a tricky plant."

Regardless, I pushed on to T.H. Everett, the New York Botanical Garden's late horticultural sachem. He turned out to be an unmitigated gardenia disparagist. In his epic *NYBG Illustrated Encyclopedia of Horticulture* (1981), Mr. Everett dismissed gardenias peremptorily: "They are not good houseplants. Their environmental requirements are too exacting"; they will "deteriorate and eventually die." Liberty Hyde Bailey, in his *Standard Cyclopedia of Horticulture* (1933) wrote that despite the gardenia's

mid-19th-century rep as "one of the finest stove shrubs in cultivation...it is one of the most difficult plants to handle."

Whenever I get really desperate for plant info I call the Bronx and ask for Lothian Lynas*. A crack English research librarian, Mrs. Lynas is the New York Botanical Garden Library's Miss Marple. So I called her about gardenias. Exactly who was the gardenia's Alexander Garden? Besides Billie Holiday, who wore them in her hair so much they became her trademark, was there an American angle to the gardenia? Within the hour Mrs. Lynas phoned with the particulars on Dr. Garden (1730-91): Scotland-born physician; 30 years resident in Charleston, South Carolina; went back to Britain in 1782 upon confiscation of his newly American property, he having remained an English Loyalist during the Revolution; naturalist; fellow of the Royal Society; friend and correspondent of naturalist John Ellis. Ellis and Garden both corresponded with the Swedish botanist, Carolus Linnaeus, and each petitioned Linnaeus to name a plant for the other. Mrs. Lynas reported, "Some miserable little plant — *Ellisia nyctelea* — got named for Ellis, while the gardenia went on to glory." The American angle, pre-Lady Day's jazz immortalization of the flower as camouflage for a cigarette burn in her hair, Ms. Lynas related, was that in 1760, Linnaeus had grudgingly bestowed Alexander Garden's name on a deliriously fragrant plant recently introduced to England from the Far East, *while Dr. Garden was still resident in colonial America*. Linnaeus groused that by calling a gardenia a gardenia he was "sacrificing science for friendship," and peeved, "I cannot but forsee that this measure will be exposed to much censure," considering, "the ill-natured objections, often made against me, that I name plants after my friends, who have not publicly contributed to the advancement of science." Mrs. Lynas noted that Dr. Garden certainly had not contributed to the advancement of gardenia cultural science. Of two gardenias sent Dr. Garden in 1762, one was DOA and the other died within a year. A despondent Dr. Garden wrote Ellis that the gardenia's "sudden death I take to be no good omen for the continuance and duration of my botanical name and character."

Mrs. Lynas invited me up to vet the NYBG's Gardenia File, a folder filled with many not altogether good-natured objections to the gardenia's captious character by all manner of garden griot. "A most cantankerous house plant...Gardenias can make the most secure gardener nervous" (Linda Yang). "A more finicky flower couldn't have been found" (Tovah Martin). "I might as well warn you right now that gardenias...are mean plants to handle" (Anonymous). "The world's most frustrating house plants...finicky and fractious in a living room" (Jeanne Goode). Indeed, Ms. Goode's

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* Lothian Lynas retired in 1991 and returned to England.

gardenia, "a plant that is almost always suffering," sounds like a real plant martyr. "More symptoms of distress can appear on a gardenia in a week than most plants display in a lifetime. These plants rebel in most houses." Furthermore, "gardenias are intolerant of mistakes and resent change." So who'd want to live with one? "There are no remedies, just things you can do wrong." Clearly, I was unsuited to the gardenia's conservative and imperious lifestyle. Aside from the standard admonitions to keep up "atmospheric humidity" ("gardenias grow best in a rain-forest-type climate") and acidity ("applications of sulfur") and recommendations for "good, hard syringing" with "plain water," no gardenia sage advised anything beyond what I was already doing, or offered much hope of placating the plants.

My gardenia enlightenment happened two years ago, on the day another of my plants gave up the gardenia ghost. A good gardenia-growing friend from high-rise Manhattan, Edith Chang, dropped off her gardenias for the summer in my Brooklyn garden. Quite emphatically she declared that what gardenias really need is to drop acid fairly often. Mind you, not just the occasional hit of Miracid, but everyday breakfast acid: COFFEE GROUNDS! At the time I was trying to kick the coffee habit. For the sake of my gardenia futures I now had good reason not to. Instead, I began mixing a morning slurry of Italian dark roast espresso grounds and using it to top off the daily gardenia watering with an acid chaser. (At the same time I made rain-forest-sure that the cachepot beneath each gardenia held at least 1 1/2 inches of plain water for daylong pseudo-tropical humidification and soil moisturizing.)

I also became an obsessive pest inspector, joining battalions of ladybugs, green lacewings and praying mantises on routine patrol of the plants for scale, mealy bug and red spider mite — pests that love gardenias as much as I do. (Lacewings and mantises even like to lay their eggs on gardenias.) The only other gardenia requisites seemed to be a bright, sunny indoor winter pot spot and five months' summering al fresco. (Even the New York City out-of-doors tones up the plants fast.) Two weeks of fresh-air camp and the gardenias are flush with buds and shiny new leaves.

Coffee grounds have made the critical difference in my relations with these notoriously difficult plants. I haven't offed a gardenia since 1988. Which makes me wonder why coffee is never suggested in gardenia-coddling instructions. Could it be fear of some obscure botanical incest taboo? Both gardenia and coffee are members of the Rubiaceae family, subfamily Cinchonoideae.

My java jive to other gardenia placators: do not hesitate to ply the gardenia with the grounds of its near relation, *Coffea*. Share the extended family acidity. By the strength of strong coffee grounds I've brought two gardenias back from the brink, nourished one scrawny three-inch mail-order cutting to flourishing stove-shrub size



THE FRANK DRIGGS COLLECTION

Billie Holiday immortalized gardenias in jazz and America, by wearing — not growing — them.

and rehabilitated one massive mealy bug-mauled plant. In the New York City rainforest this summer, the gardenias of Gotham have performed spectacularly.

Elvin McDonald, author and houseplant aficionado, once observed: "So many writers have cast an aura of mystery about the gardenia and its culture that gardeners sometimes lose all common sense handling the plant." He admonished: "Approached calmly, gardenia culture is not any more complicated than that of such common plants as the African violet, begonia and geranium." Happily becalmed amid my gardenias I might add: gardenias are easy to grow given an acid enough approach.

This article first appeared in the *The Wall Street Journal* on September 13, 1990. It is reprinted with the permission of the author.

Orchids

In their tropical habitats, orchids thrive side by side with such commonly grown houseplants as bromeliads and begonias. An avid collector tells how to make them thrive on your windowsills, too

BY CHARLES MARDEN FITCH

Growing tropical orchids in your bright windows is a challenge worth pursuing. In their tropical habitats, orchids thrive side by side with such commonly grown houseplants as bromeliads, begonias, philodendrons and jungle cactus. Orchids will grow equally well in your home once you understand their basic needs.





CHARLES MARDEN FITCH

If you've never grown orchids, begin with mature, established plants. Above is *Phalaenopsis* Marion Fowler.

In my collection, orchids grow well in bright living room and photo studio windows. In the basement, seedlings and compact orchids grow under broad-spectrum fluorescent lights. From June to September, many of my mature orchids sojourn outside on raised benches or on a terrace table where bright light, abundant fresh air and summer rains encourage sturdy growth.



If you are new to orchid growing, begin with mature, established plants, preferably from a nursery where your questions will be answered by experts. Occasionally, flowering dendrobium and phalaenopsis orchids appear on sale at supermarkets, but it is a rare produce manager that is capable of supplying the detailed information that you need to grow the plants.

Specialists at orchid nurseries will be pleased and equipped to answer your questions. I recommend buying established plants rather than attempting the complicated and time-consuming process of growing orchids from seed. Most orchids must be five or six years old before making their first flowers indoors. Although raising small seedlings is slightly easier, it's still not a wise venture for beginners.

Starting with mature plants offers the advantage of instant flowers when you select orchids in bloom or bud at a nursery. In addition, established plants will tolerate occasional cultural mistakes. Mature orchids with well-developed water-storing stems (pseudobulbs) can endure weeks without watering. Larger plants are also more adaptable to variations in humidity and light.

IDEAL INDOOR CONDITIONS

Many tropical orchids do well with 50 to 60 percent relative humidity, a nighttime temperature range of 50 to 70° F, bright diffuse light and good air circulation. Orchid seedlings in general do better with warmer, moister conditions than mature plants. If you provide these conditions, an abundant array of orchid genera will grow for you.

Orchids can be divided into groups according to their preferred nighttime temperatures. The most popular group thrives with nights between 60 and 65° F. A second group, called cold-preference orchids, does best with cool 50 to 60° F nights. This group includes standard-sized cymbidiums, masdevallias, odontoglossums, many laelias, green-leaved paphiopedilums and any orchid species native to high altitudes in the tropics. A third category includes orchids that perform best with warm 68 to 70° F nights, such as most vandas and their hybrids, phalaenopsis, paphiopedilums with mottled leaves and other genera found in tropical lowlands.

Hybrid orchids are generally more adaptable to environmental differences than pure species. Most adaptable of all are the complex hybrids in large-flowering genera bred for vigor, floriferousness and flower quality. This group includes hundreds of cattleya hybrids, cymbidiums, dendrobiums, vandas, ascocentras, paphiopedilums, phalaenopsis and oncidiums. With all these varied orchids from which to choose, you're sure to find several that fit your taste and growing conditions.



CHARLES MARDEN FITCH

Green-leaved paphiopedilums, such as *Paphiopedilum* Niobe, above, a tropical lady slipper orchid, do best with cool, 50 to 60° F nights.

PROVIDING A SUITABLE ENVIRONMENT

For maximum success, create airy, humid growing spaces in front of your brightest windows. I use plastic trays and window boxes with an inch of white gravel at the bottom. The gravel is kept moist to create a locally humid atmosphere. Another useful technique is to fill waterproof trays or windowboxes with several inches of water, then set the orchid pots on plastic, metal, or wooden grids resting over the water-filled containers. If you choose this method, be sure your windowsill or shelf is sufficiently sturdy to withstand the weight.

To further foster humidity, surround the potted orchids with foliage plants and other tropicals such as bromeliads. If the local humidity is still below 50 percent consider adding a small electric humidifier. The type that attaches directly to a water pipe is most convenient — small portable units may need refilling several times a week. Meanwhile, keep air circulating with a small fan aimed at a nearby wall or the ceiling.

LIGHT INTENSITY

In their tropical habitats, some orchids grow in full sun, while other species of the

same genus may prefer shady situations. In general, orchids with thick, waxy leaves need bright light whereas those with thin foliage need less intense light. Of the popular cultivated orchids, vanda hybrids, epidendrums and many dendrobiums need the brightest light while cattleyas, oncidiums and cymbidiums do best with diffused light at midday but direct sun in early morning or late afternoon. Phalaenopsis, paphiopedilums and odontoglossums will blossom with medium light – that is, in a bright window where no direct sun hits the leaves except very early or late in the day.

To prevent sunburn, move orchids into brighter light gradually, or shade them during midday when the sun is most intense. Orchids in bloom may be displayed under low light conditions for several weeks without harming the plant. Just remember to provide bright light when new growth begins. Orchids grown with insufficient light have deep green foliage but seldom bloom. Plants given too much light are yellow-green and may develop burned patches.

GROWTH STYLES

Indoor orchids are either epiphytic (adapted to growing in the wild on trees and mossy rocks) or terrestrial (adapted to living in well-drained soil). Orchids I study in their tropical habitats actually show a range of perch preferences varying from bare tree bark or hard clean rock to gravelly soil or humus along stream banks. Similarly, orchids in cultivation succeed in many different potting mixtures. Epiphytic orchids such as cattleyas and epidendrums thrive in rapidly draining mixtures of tree fern or fir bark with charcoal, coarse perlite and similar ingredients. The terrestrial (or ground-dwelling) genera such as cymbidiums and paphiopedilums need a finer mixture that holds more moisture but still has excellent drainage. When you buy your first orchids, be sure to ask the professional grower to recommend a suitable potting mixture. In my collection, I use a base mix of tree fern or fir bark with hardwood charcoal and coarse perlite (volcanic rock). If the orchid needs more moisture, I add coarse New Zealand sphagnum moss or employ a smaller grade of bark or tree fern. Some of my orchids do well with a base mixture of ground cork but the cork tends to decompose in 15 to 20 months. Repot orchids when they outgrow their container or when the mixture deteriorates. Fully rotten potting mix holds too much moisture and will encourage root rot.

CHOOSING POTS

For terrestrials and smaller epiphytic genera, I like plastic pots with extra drainage holes. One design (the Rand aircone pot) has an inner central cone with air holes allowing the center of a filled pot to receive air movement. However, large orchids tend to be unstable in plastic pots and they should be given heavy clay containers.



CHARLES MARDEN FITCH

For success with orchids, create airy, humid growing spaces in front of your brightest windows. Above is *Brassolaeliocattleya* 'Talisman Cove'.

Special clay pots are available with extra side drainage holes especially designed for epiphytic orchids. Repot orchids when new growth begins, usually in spring and summer. Avoid disturbing roots during blooming or resting periods.

Increase drainage and air circulation by using an inch or two of coarse gravel, hardwood charcoal, or styrofoam "peanuts" in the bottom of each pot. Add an inch of potting mix, then spread the plant's roots over the mix and gradually tuck in more of the growing medium, occasionally tapping the pot on a hard surface to settle the mix around the roots as you work. Before trying to pot or transplant your first orchid, it's wise to watch an experienced grower perform the procedure.

MOUNTED PLANTS

In environments where humidity is high, equitant oncidiums (dwarf oncidiums with succulent, often grooved, leaves), smaller encyclias and many other miniature epiphytic orchids can be successfully grown mounted on slabs of bark, tree fern or cork. However, bear in mind that mounted plants usually require more attention because they dry out rapidly.

WATERING

Orchids with pseudobulbs can live for weeks without root watering if the atmospheric humidity is high. In fact, a common cause of orchid mortality is overwatering. Even terrestrial orchids must have good air circulation around the roots. Too much moisture, especially when plants are not making rapid growth, often leads to root rot.

Clear plastic pots, such as the Rand type, or clay pots with extra side drainage holes are ideal because you can readily observe the moisture level of the mix. After a few seasons of experience, you will know how often different orchids need watering under your growing conditions. Factors that influence how often your orchids need water include: relative humidity, light intensity, air circulation, formula of the potting mix, type of pot used and the growth stage of each plant.

How do you tell when an orchid needs water? If the orchid in question has pseudobulbs, watch the plumpness of the bulbs just behind the active growth (the newly forming pseudobulb). When the mature pseudobulb begins to shrink (that is, it develops slight grooves) it is safe to soak the roots. For plants in clay pots, I tap each pot with my ring or fingernail. A light hollow sound indicates a dry potting mix, a thud means the mix is moist. Lifting a pot to judge its weight is also useful. Learn how to judge by lifting pots just after watering, then compare the weight several days later when the medium is dry. In clear plastic pots, you can easily observe the moisture of the roots. Dry roots are white, wet roots are green or gray.

WHICH ORCHIDS?

How do you choose which orchids to grow? Aesthetics is as good a basis for choosing as any. If you love cattleya type flowers, then cattleya hybrids should fill your windows. Within popular orchid groups, you can find hybrids that fit both your preferences and conditions. Visiting local orchid shows and orchid greenhouses will help you learn about different genera.

LEARNING MORE

The best way to continue to learn more about orchids is to join the American Orchid Society. New members receive a free culture handbook. A most important monthly benefit is the colorful *A.O.S. Bulletin*. Articles feature growing information, new trends in hybridizing and profiles of orchids. Advertisements offer supplies and plants from dealers in many countries. For a free membership leaflet write:
American Orchid Society • 6000 South Olive Ave. • West Palm Beach, FL 33405-4159

Water Does Not Mean Love

In hot, dry rooms where most houseplants languish, some succulent is sure to thrive

BY LINDA YANG

"If in doubt let them do without" seems to be the motto of those who grow cacti and other succulents. No, these are not a callous group of plant haters. They are perfectly nice people who have learned to control what seems to be a natural inclination when it comes to houseplants — that is, equating love with water.

Zabel Meshejian, president of the New York Chapter of The Cactus and Succulent Society, waters once a week. And she has learned that nothing dire happens when her plants are ignored for two weeks.

The diverse group of plants known as succulents, a category that includes cacti, has survived by adapting to drought. For this reason, quite a few make good houseplants. In hot, dry rooms, where foliage plants may falter, some succulent is sure to survive — if it isn't killed by an overdose of water.

TOVAH MARTIN



Succulents such as these living stones (*Lithops* spp.) are adapted to drought.

START CHEAP

Don't be embarrassed to start your cacti and succulent collection with the inexpensive plants from dime stores, florists or botanical garden shops. You can't become an expert without making mistakes, and it's better to kill cheap purchases first. You can also order from one of the following specialty mail-order suppliers:

ABBEY GARDENS
4620 Carpinteria Ave.
Carpinteria, CA 93013
Catalog $2 (Refundable with order)

ARID LANDS GREENHOUSES
3560 West Bilby Rd.
Tucson, AZ 85746
Free List

HIGHLANDS SUCCULENTS
1446 Bear Run Rd.
Gallipolis, OH 45631
Catalog $2

RAINBOW GARDENS
1444 East Taylor St.
Vista, CA 92084
Catalog $2

SINGERS' GROWING THINGS
17806 Plummer St.
Northridge, CA 91325
Catalog $1.50 (Refundable with order).

Then, too, there's nothing like hobnobbing with gardeners with similar interests. For information on the Cactus and Succulent Society of America, Inc., write to Mindy Fusaro, OOB 35034, Des Moines, IA 50315-0301. Yearly dues are $30.

The word succulent is derived from the Latin, *sucus*, and means juicy or fleshy. Although all plants store some water in their roots, stems or leaves, the storage ability of succulents is highly developed.

Succulents include an enormous diversity of species, culled from over 20 families. Many have grotesque or bizarre looking swollen trunks, stems or leaves. In effect, they're the plant world's equivalent of the camel. Indeed, it is precisely because of their extraordinary sculptural forms – ugly, weird and beautiful – that so many find them endlessly fascinating.

GEORGE ELBERT



Sansevierias, leathery-looking members of the lily family, are easy to grow.

Although Ms. Meshejian has experimented with many kinds in the past decade, her present passion is the group known as caudiciforms, succulents with trunks swollen at the base where water and nutrients are stored. Included are the wildly sculpted elephant's foot (*Dioscorea elephantipes*), whose segmented bark has corrugated, angled knobs out of which springs a thin stalk with heart-shaped leaves and chartreuse flowers, and the more graceful desert rose (*Adenium obesum*) whose fleshy, twisted branches bear thick green and pink leaves and rose-colored flowers.

According to Bill Ballard, co-owner of Highland Succulents, a nursery in Gallipolis, Ohio, people often start buying these plants strictly on the basis of their peculiar looks. And then they make the mistake of watering incorrectly. It's important to understand the plants' natural life cycles, according to Mr. Ballard. And this is a function of the plants' native habitats.

TOVAH MARTIN



Many succulents have striking, sculptural forms. Above is *Crassula simsii*.

In autumn, for example, plants native to South Africa or the Canary Islands are preparing for summer, and thus are entering a period of active growth. So this is the time to begin regular watering of plants like the dragon-tree aloe (*Aloe dichotoma*), which has thick, silvery green-edged, barbed leaves,



TOVAH MARTIN

Asterophytum myriostigma and other succulents require a fast-draining soil.

and *Euphorbia atropurpurea*, which has narrow, silvery blue foliage. Regular watering for these winter growers means moisture once a week or so, depending on the room's heat and light.

Succulents entering a period of growth in autumn can also be treated to a monthly solution of a diluted, all-purpose fertilizer. On the other hand, in autumn, plants native to Central America and Southwestern United States are preparing for winter, and thus are entering a period of rest. So, this is the time to stop watering cacti like the old man (*Cephalocereus senilis*) which is shrouded in what appears to be long white hairs, or *Mammillaria elegans*, which is covered by short, sharp spines.

Plants entering a dormant period should be neglected — just short of the point at which they begin to shrivel, according to Lem Higgs, owner of Abbey Garden Cacti and Succulent Nursery in Carpinteria, California. As a general rule, these plants need water once a month or so through autumn, and then in December and January once every six weeks or so. Sometime between February and April, increase watering to every other week, because that is the beginning of their period of growth.

A fast-draining soil is also essential. A basic soil blend suggested by Mr. Higgs for most succulents is 70 percent perlite or pumice and a 30 percent combination of ground fir bark, peat moss, leaf mold and other composted organic matter.

At one time, Manny Singer and his wife Bert collected succulents from the wild. But since too many of these plants have become endangered, the couple now propagate unusual species from seeds and cuttings at their Northridge, California, nursery, Singers' Growing Things.

Mature plants that are rare and weird can be quite expensive. For example, the *Bursera microphylla*, which resembles a wind-blown bonsai, sells for over $200 at Singers' Growing Things. "I must offer condolences to people who start with plants like these and don't know what they're doing," says Mr. Singer.

He suggests that beginners start with plants such as haworthias, many of which sell for under $5. This group, which includes several hundred species, are typically small, fleshy-leaved plants whose plump foliage is arranged in a star shape called a

rosette. Among the common names applied to some haworthias are the pearl-plant and zebra haworthia. These are apt descriptions of the pearl-like dots on the leaves that are sometimes spaced so closely they resemble stripes.

Although succulents are often associated with heat and sun, haworthias are among the species in this extraordinarily varied group that actually prefer some shade. Two to three hours of sunlight daily is fine for *Haworthia truncata*, *H. maughanii*, *H. retusa* and *H. cooperi*, for example.

Even less sunlight — just a brightly lit room — will also suffice for a number of sansevierias, another huge group of succulents collectively known as snake plants. Sansevierias are leathery looking members of the lily family whose elongated, upright silver, green or gold foliage comes in assorted stripes or mottled patterns. Some sansevierias have long, cylindrical leaves, while others are short and squat and look like bird's nests.

CHARLES MARDEN FITCH



Hoyas require less light than other succulents. Above is *Hoya carnosa*.

Also surprising are the cacti that do not like sun, do not grow in the desert and have no markedly prickly spines. These are the tree perchers, or epiphytic jungle cacti. Chuck Everson, owner of Rainbow Gardens in Vista California, is especially fond of this group of succulents, which are also known as orchid cacti.

Many orchid cacti have graceful cascading limbs that make them ideal for hanging baskets. Best known are the Christmas and Thanksgiving cacti, whose blooms are borne on flattened, segmented stems. There are quite a few new hybrids, according to Mr. Everson, including one called 'Bridgeport', which has pure white flowers and upright, rather than pendulous stems, and 'Santa Cruz', whose large flowers are peach and white.

Also useful for low-light sills are the hoyas, another group of pendulous succulents. One easily grown species, the sweetheart hoya (*H. kerrii*) has heart-shaped leaves and peculiar, flattened, globe-shaped blooms in summer.

As winter approaches, be stingy when watering these plants. But how do you know exactly how much to add? "Stick your finger into the soil down past the first joint," Mr. Everson suggests. "If there's no moisture, it's probably time to add some — I guess you could say this is a rule of thumb that sometimes works."

Adapted from an article that first appeared in *The New York Times*.

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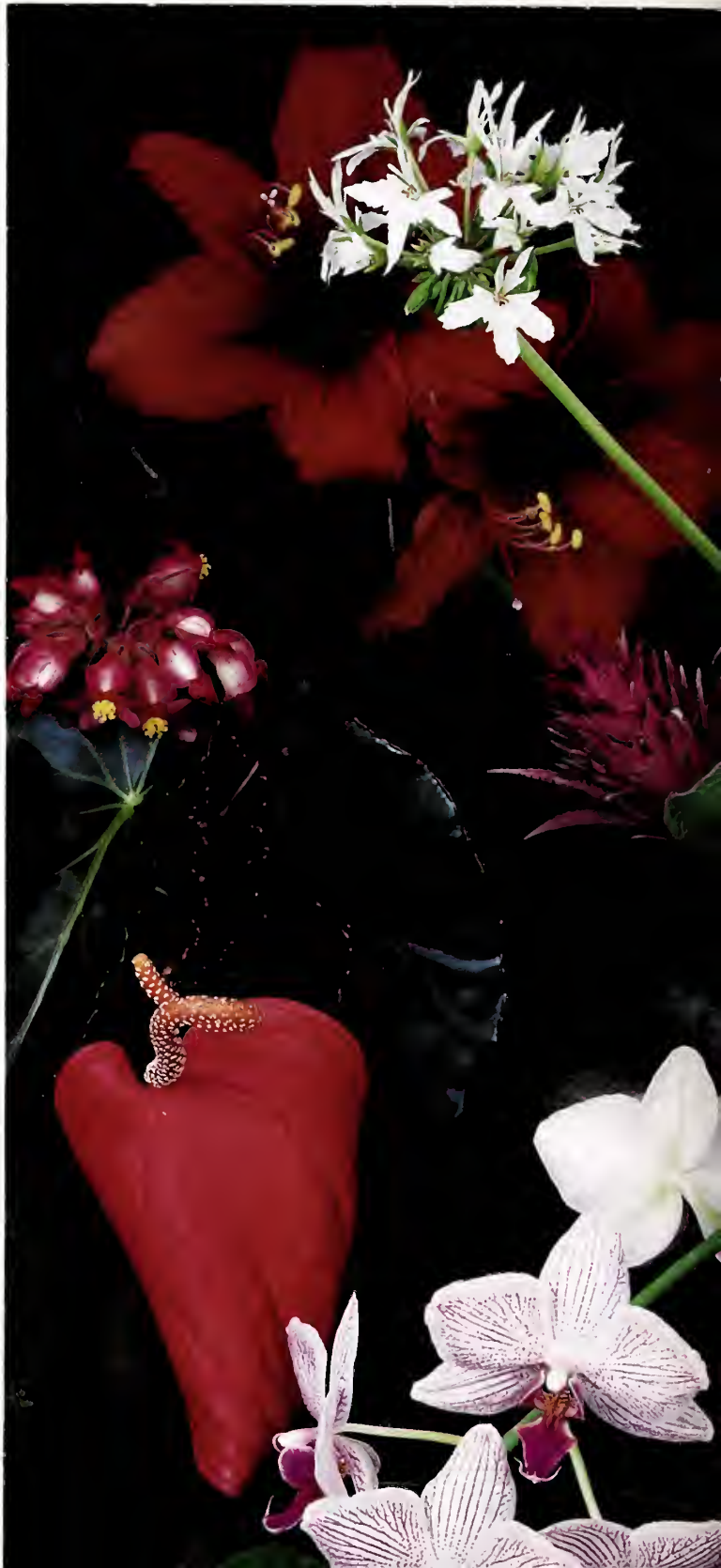
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